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Christopher Heath Esq
with the author's
very kind regards
Dec 19'.03.

STERILISATION OF URETHRAL INSTRUMENTS

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THE STERILISATION OF URETHRAL INSTRUMENTS AND THEIR USE IN SOME URINARY COMPLAINTS

BY

HERBERT T. HERRING,

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WITH ILLUSTRATIONS

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PREFACE.

THERE is no branch of surgery, I think, in which the ordinary rules of surgical cleanliness are more frequently violated, than in that connected with urinary complaints. Everyone now recognises the necessity of taking efficient precautions against the contamination of a wound with micro-organisms, even in the most trivial *cutting* operation. The operator himself, his hands, and those of his assistant, the patient's skin, the instruments, the sponges, the ligatures, the sutures, the dressings, and, oftentimes, the room itself, are scrupulously prepared before the operation is commenced. Each of these factors has, in its turn, received a large amount of study, undertaken with the object of ascertaining the best method of acquiring, as nearly as possible, absolute sterility.

Yet, notwithstanding the overwhelming evidence, collected from these and other sources, that micro-organisms are the fundamental cause of many diseases, both in the urinary organs and elsewhere, no serious attempt has been made to formulate an easy and systematic method of passing *sterile* instruments in the treatment of urinary complaints.

Urinary surgery in this respect, with few exceptions, remains where it was before the great Listerian principles were propounded. Thus, the preparation either of the operator's hands, the patient's penis, the catheter, the bougie, the syringe or other instrument, or the lubricant—and its usually septic method of application—is entirely overlooked, or the various steps are performed in such a perfunctory manner that they are useless. For instance, the idea that an instrument is *sterilised* by dipping it into a solution of 1 in 40 carbolic acid, or even a weaker antiseptic, still prevails; and, what is as frequently seen, the common oil or vaseline jar, which has done duty many times before, very likely in a variety of septic ways, is produced without a thought, and the lubricant smeared over the surface of the instrument with *dirty fingers!* or, again, a patient is *told* to make a urethral injection, without instructions! and without a word of warning as to the necessity for sterilisation! No abdominal or other surgeon would dream of using any instrument or material prepared solely in that way in his department. He would consider the proceeding almost criminal, and there certainly appears to be no reason why this term should not be applied equally to a urinary surgeon who wilfully neglects, or omits to teach his patient, who has to use instruments himself, the well known essentials of proficient surgical cleanliness.

Professional friends and acquaintances, who accept the principle that the use of dirty urethral instruments causes the greater part of the distressing symptoms associated with urinary complaints, tell me that the idea of a patient keeping himself free from contamination is utterly *impracticable. This I totally and emphatically deny.* A patient cannot keep himself, or his instrument surgically clean, without first being taught. It is, therefore, usually the *want of teaching*, and the want of a simple method of sterilisation, not the patient's mental capacity, nor physical difficulties, which render the idea so apparently impossible.

I have endeavoured in this little book to outline a scheme which will cover the points indicated. The use of chemical germicides, for reasons given in the text, has been avoided when possible, and the method of sterilisation made simple, so that *any person* may learn, in the course of a few lessons, to use ordinary urethral instruments well, and without fear of contamination.

I have also been in the habit of supplementing practical demonstrations with written instructions, and, in the hope that these may be of service to others who meet with urinary cases, I have reproduced them, adding fresh material and sketches to make my meaning clear and complete. This book contains, therefore, a description of all the small operations a patient may have to learn, and the explanation of some of the symptoms which are sure to arise during the treatment and progress of the various diseases. Patients frequently make enquiries relative to these points, and I think the treatment is much more satisfactorily carried out, if people know what to expect, and the reason for their occurrence.

In writing this little book I have largely trenched upon the great experience and admirable advice I have so often heard Sir Henry Thompson give to patients who sought his aid, and I wish here to acknowledge my great indebtedness to him for many invaluable lessons I have received during the fifteen years I have been intimately associated with him. That the great pioneer in urinary surgery is in agreement with these principles is evident from the letter subjoined.

Finally, I have to express my grateful thanks to Mr. P. L. Daniel for the great care he has taken in revising the proof sheets, and for many invaluable suggestions in regard to bacteriological questions.

HERBERT T. HERRING.

HARLEY STREET, W.
October, 1903.

35 Wimpole Street, W.
November 16, 1903.

My dear Herring,

I have long been convinced, as it is natural that I should be, after the many years of practice I have enjoyed, that the great secret of success in the treatment of vesical and urethral diseases, is to keep the parts absolutely free from contamination by Micro-organisms; and, therefore, all the instruments employed, including those very useful ones, the Operator's hands, in the same condition.

You have by much labour and ingenious contrivance rendered the process quite possible, not only in your own hands, but in those of the patient himself, and of his attendant.

I heartily wish your endeavours the success they deserve.

I am,
My dear Herring,
Yours sincerely,
HENRY THOMPSON.

To H. T. Herring, Esq.

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THE STERILISATION

OF

URETHRAL INSTRUMENTS.

INTRODUCTION.

The Bladder and Urethra.

A clear idea of the functions and mechanism of the parts of the body concerned is necessary, before urinary instruments can be used properly by a patient. I therefore, in teaching patients, usually devote a few words to the description of the bladder, and to the passage leading from that organ to the outside, technically known as the urethra.

The urethra, encircled by muscle.

Not an open tube, and opposes the introduction of instruments.

The lining membrane.

Its general outline.

The **urethra** is a passage eight to nine inches long, encircled by muscular fibres which keep its floor, roof, and sides closely applied to one another. It is in no sense a tube as we understand an indiarubber tube, and is never open except for a few seconds when fluids are discharged from the body. It is, rather, a continuous closed valve which strongly opposes the introduction of any substance from the outside, and when this is done a definite amount of pressure must be exerted to overcome the resistance. The urethra is lined by an exceedingly delicate and sensitive membrane secreting a lubricant called mucus. Its general outline when the penis is held perpendicularly is curved, somewhat like a fish hook with the barb at the neck of the bladder, a point to be remembered in order that the slight pressure permissible, when passing instruments, may be exerted in the most advantageous direction (fig. 1, U).

The bladder composed chiefly of muscle which expels the urine.

The **bladder walls** are almost entirely composed of muscle and the bladder is only a cavity, if I may thus describe it, when it contains urine. After the expulsion of the latter, by means of the contraction of the muscular walls, a solid round mass remains, which gradually dilates again as the urine drips into and expands the cavity. The bladder, like the urethra, is lined with mucous membrane, though it is not so sensitive as the latter. In health it is stretched smoothly over the surface when the organ is distended, but in old standing urinary diseases it

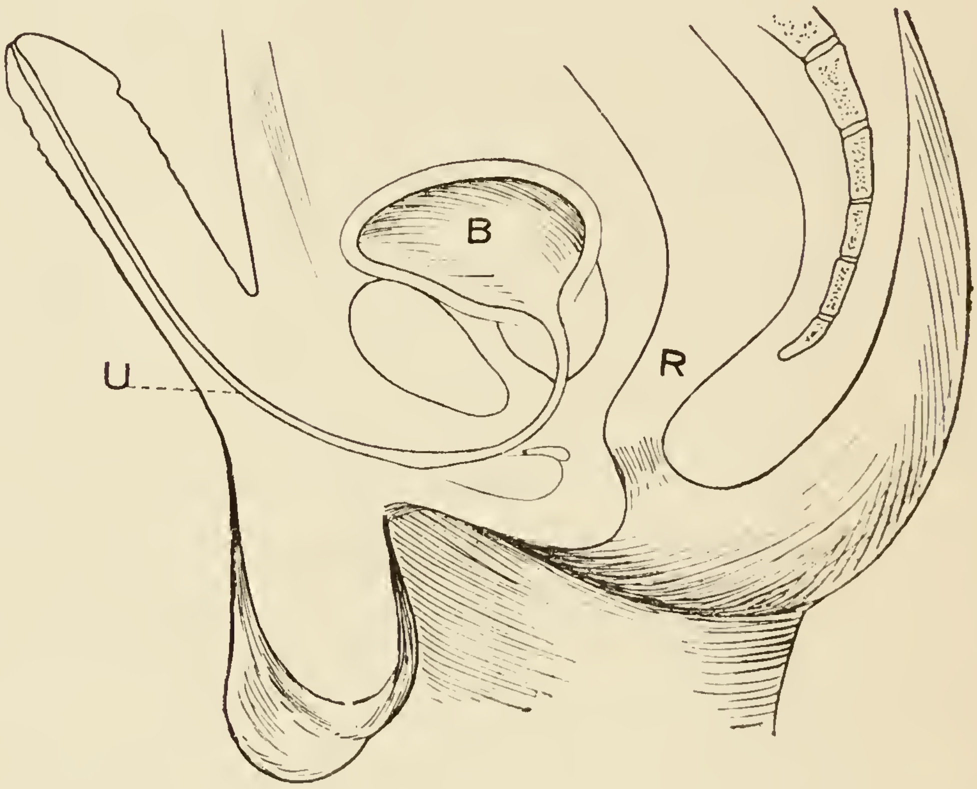


Fig. 1.—Diagrammatic section of the urinary organs showing the curve of the urethra U ; the bladder B, and the rectum R.

The lining membrane.

is frequently thrown into folds and pockets, caused either by the irregular increase in size of some of the muscular bands beneath, or by the thickening and loss of elasticity of the membrane itself.

The ureters.

The urine is conveyed into the bladder from the two kidneys by canals called **ureters.** The flow down these passages is more or less continuous, with periodical spurts of urine, though the rate is constantly varying. The bladder is therefore never at rest, but either dilating gradually, or expelling its contents with considerable force.

CHAPTER I.

URETHRAL INSTRUMENTS AND THEIR SELECTION.

AFTER these preliminary remarks, I proceed firstly to describe to the patient the particular instrument he has to use; it may be (1) a **catheter,** or (2) a **bougie,** or (3) a **syringe** for making an injection into the bladder or urethra; secondly, the manner of sterilising it and the parts coming in contact with it; and finally the actual method of introduction.

(1) THE CATHETER AND ITS VARIOUS FORMS.

Definition.

A **catheter** (fig. 2) is an instrument used to withdraw or to introduce fluids into the bladder, and is rarely used for the purpose of treating stricture. It is a tube ten or twelve inches long open at both ends. The internal opening, or eye, is situated at the side rather than at the extreme point. For the convenience of description it may be said to have an external and an internal end, the latter terminating in the point, and also a shaft which lies between the eye and the external end. A catheter may be quite rigid and made of metal, compelling the urethra to take its form when passed, or soft and supple, composed of indiarubber or some material, which enables the instrument to adapt itself to the curves of the passage it has to travel.

Its construction.

The eye.

External and internal end.
The point.
The shaft.
Catheters may be metallic or soft.

(A) Metal catheters.

(A) A **metal catheter** (fig. 3) has, as a rule, a

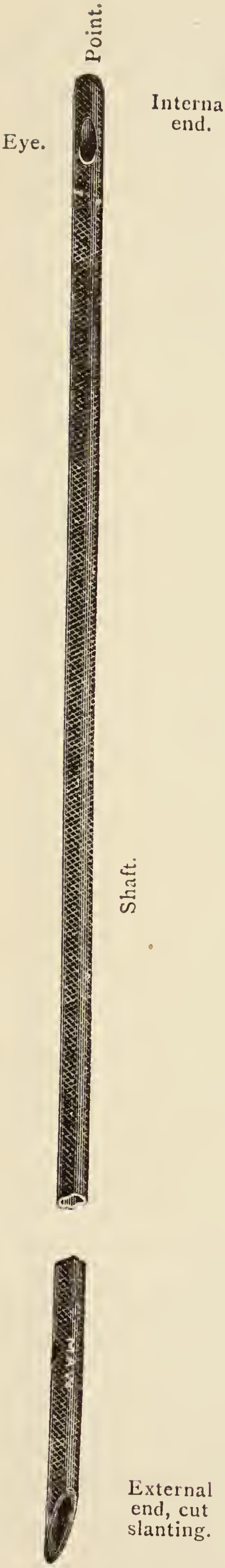


FIG. 2.—A catheter.

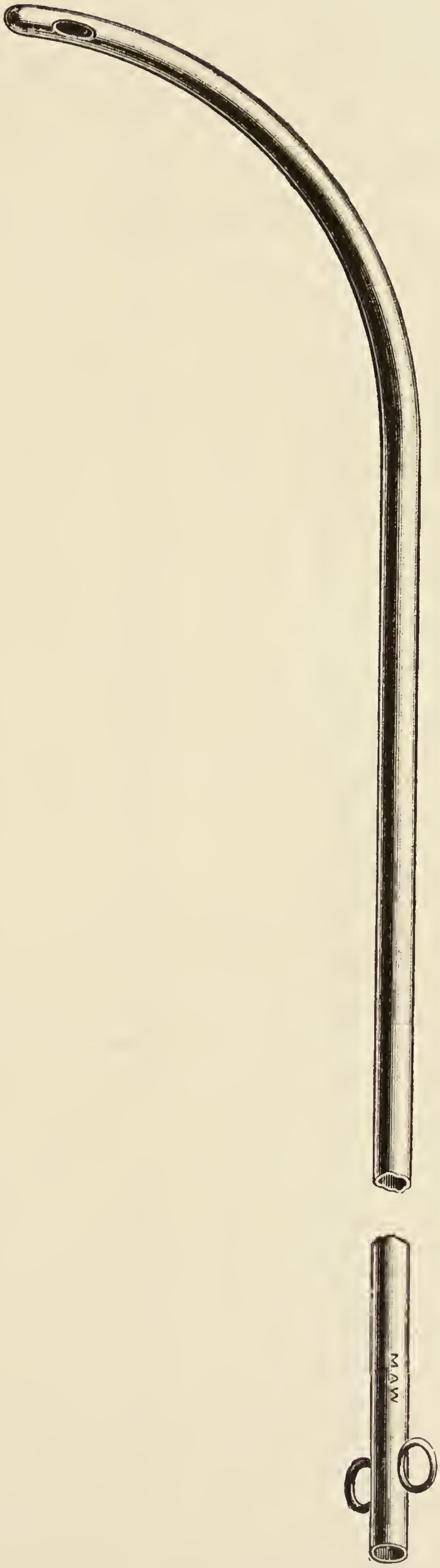


FIG. 3.—A metal catheter with special curve

shaft of about eleven inches long, which ends in a bold sweeping curve of a special form. Attached to either side of the outer end are two small loops. It is made of silver, or of some baser metal electroplated.

(B) Soft catheters of many forms.

(B) **Soft catheters** vary considerably in flexibility, they may be as limp as indiarubber or as stiff as whalebone. Numerous shapes have been devised to suit individual requirements and among those generally recognised are :—

(*a*) The olivary catheter.

(*a*) The **olivary** (fig. 4 B), a straight instrument usually fairly supple. The point is formed by a small rounded head or olive connected to the shaft by a *thin flexible neck*, which allows the instrument to insinuate itself along a difficult passage without harm to the surrounding parts. The eye is usually situated at a considerable distance from the point, though in some varieties the neck is shortened (fig. 4 A).

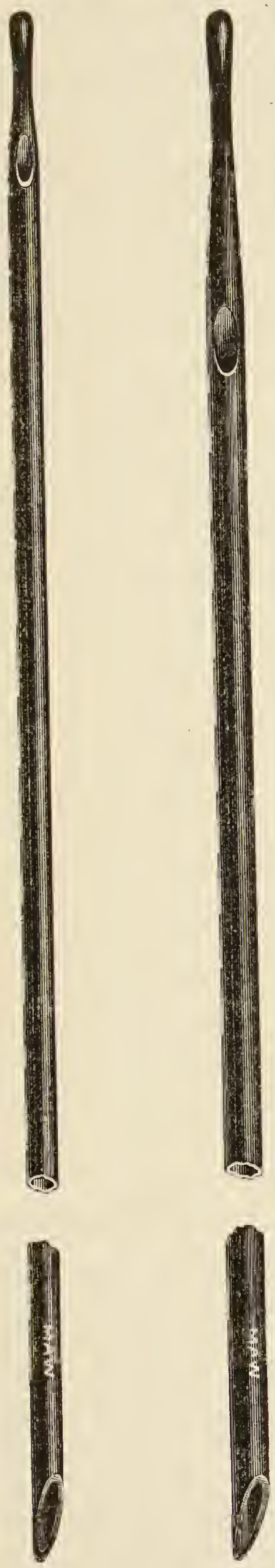
(*b*) The coudée catheter.

(*b*) The **coudée** (fig. 5), (French *coude*, an elbow) so termed because about half an inch of the internal end is turned up, forming an obtuse angle with the shaft. This enables the instrument to ride over any obstruction on the floor of the passage *if the point is kept towards the roof*. The eye is on the side of the turned up portion and is quite near the end.

(*c*) The cylindrical catheter.

(*c*) The **cylindrical catheter** (fig. 6) has a smooth round end, with the eye near the point, and is quite straight.

The flexibility of soft catheters varies with the material with which they are manufactured, thus, all forms are exceedingly supple when made with indiarubber, less so when *silk web* is substituted,



A B

Fig. 4.—Olivary catheters.
Two forms.

Fig. 5 —A
coudée catheter

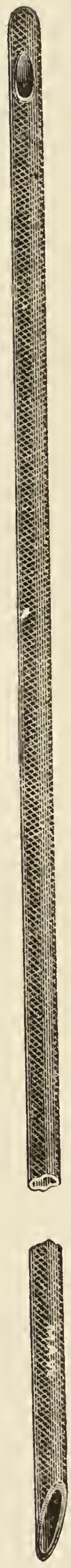


Fig. 6.—A cylindrical
catheter (silk web).

the framework of the instrument then being woven in silk afterwards cemented together by an elastic preparation of gum, and the least of any when cotton replaces the silk. The consistency of the gum, too, produces different effects. Cotton web catheters are often dressed with an exceedingly hard gum which is, however, easily moulded into the required curve by heat. Special names have been given to the cylindrical forms which are made in indiarubber and cotton web. To the former the term **Jaques** (fig. 7) is applied, and to the latter **English gum elastic catheter** (fig. 8), which is also usually furnished with a curved wire or stylet.

THE SELECTION OF CATHETERS.

The question of the kind and shape of catheter to be used must be decided by the medical man, and must, of course, depend on the peculiarities of the case to be dealt with. The **metal catheter** should be of a special curve, and that which I have found most generally useful is figured on p. 5. It is the curve made and adopted by Sir Henry Thompson. As a rule, however, especially if catheterisation is frequent, metal instruments, formerly almost universally employed, will not now be recommended, and the following hints may perhaps be of assistance in selecting suitable instruments of the flexible varieties.

The curve of a metal catheter.

The choice of soft catheters.

All catheters should have a highly polished and smooth surface. The walls (figs. 9 and 10 A) should be thin, giving as large a bore (B) as possible. The

The surface.

The walls.

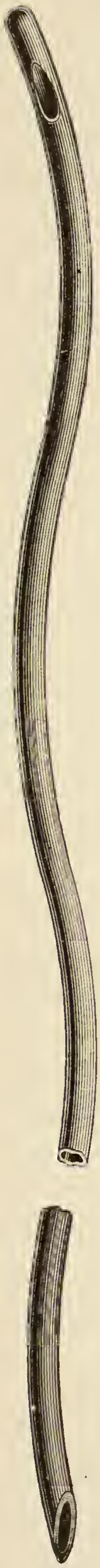


FIG. 7.—An indiarubber catheter (Jaques).

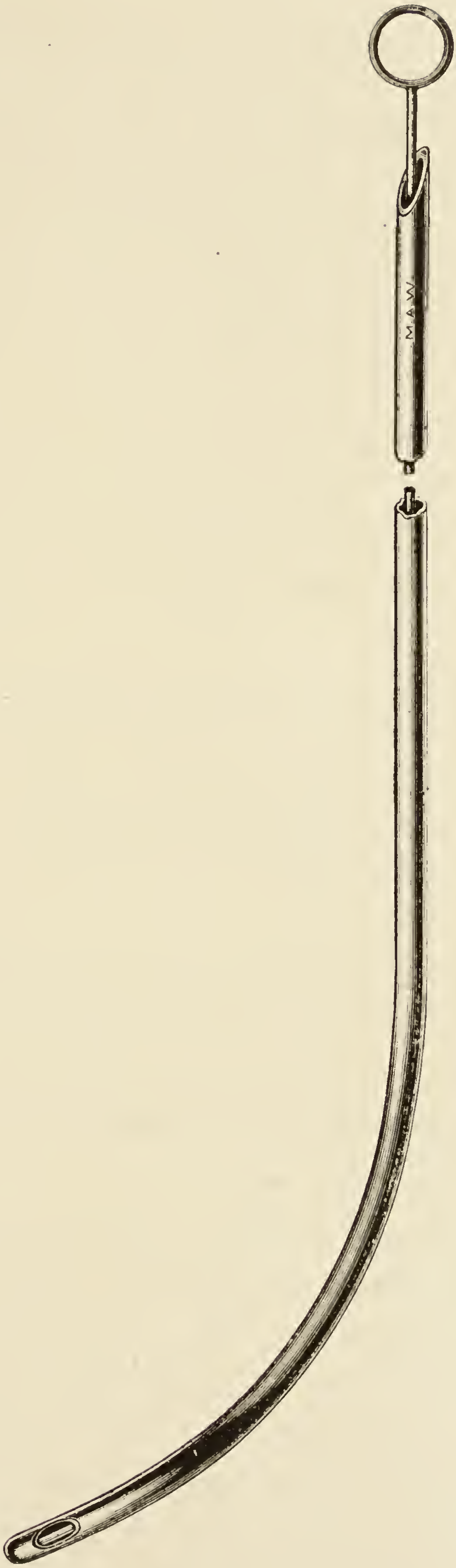


FIG. 8.—An English gum elastic catheter and stylet (cotton web).

The eye and its situation.

Objection to olivary catheters.

End to be solid and without recess.

eye (C) should be equal in size to the bore, with smooth rounded lips (E) and situated near the point (D). The situation of the eye, often one inch from the end, is an objection to the olivary form of catheter, for this amount has to be pushed into the bladder before the urine runs. It is, of course, of no consequence when the bladder is full, but as it empties the point must necessarily come in contact with the walls. A second eye situated on the opposite side of the shaft, in the coudée and cylindrical forms, three quarters of an inch from the point is sometimes an advantage. The end of the catheter should have no recess as in fig. 9 F, but should be filled in (fig. 10 D). And finally a soft catheter should be able to withstand the action of boiling water without suffering material damage.

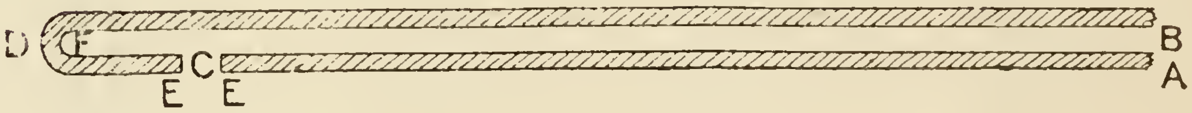


FIG. 9.—Section of badly constructed catheter. A, thick wall; B, small bore; C, small eye some distance from the point D; with square short lips E; and recess or cul de sac in the internal end F.

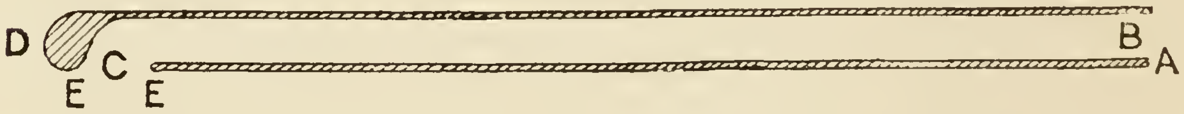


FIG. 10.—Section of well constructed catheter. Thin wall A; large bore B; large eye C; close to the point D; with smooth lips E, and no cul-de-sac in the internal end.

Catheters to be flexible.

Catheters for general use should be flexible, unless some circumstance exists which contra-indicates them, they should bend easily, retain the new position and not spring back as whalebone does, that is, they should possess the character which may

Though not too supple.

be described as "doughy." On the other hand, extreme suppleness is not advisable. Such an instrument requires a great deal of fingering and manipulation to introduce it, a practice which is to be carefully avoided, as will be pointed out later (p. 56). I therefore do not, as a rule, recommend indiarubber, but prefer for general use a well made coudée or cylindrical catheter.

Cutting external end of catheter slanting.

Another useful hint is to cut the external end slanting, removing entirely the bone collar so often supplied with instruments, and shortening the catheter itself to a length convenient for the patient. The "slant" should be made so that it faces the patient when the catheter is held correctly for passing.

Advantages.

It affords an easily recognised mark by which the instrument can be kept in the proper position during its introduction, enables the urine to run in a steady stream from the end, and also facilitates the junction of the nozzle of a syringe should that be necessary (p. 115).

Natural shape of soft catheters to be retained.

Soft instruments should be put away quite dry and not bent or twisted, their natural shape and curve should be invariably retained; it is, therefore, important not to crowd them into boxes too short to receive them.

Packing for hot climates.

If they are to be sent to tropical climates they must be packed in powdered French chalk or lycopodium, to prevent them sticking together and thus spoiling the surface, at least this accident is what generally happens with most kinds, especially if they are of French make.

The size measured by English and French gauge.

The size too is of great importance. There are **two gauges** by which urethral instruments are measured The English, which ranges from No. 1 to 16 and is purely arbitrary, slight variations occurring according to the different manufacturers, and the French scale, which ranges from No. 1 to 26, the number indicating in millimetres the circumference of the particular instrument. The sizes suited for habitual use when the urethra is of ordinary dimensions and in good condition are *Nos. 6, 7 and 8* English, or the approximately corresponding *Nos. 11, 12, 13, 14 and 15* of the the French gauge.

Sizes most suited for use.

(2) THE BOUGIE, ITS USE AND FORM.

The use as a wedge for strictures.

The **bougie** is an instrument used to dilate or keep open a narrowing which has occurred in the urethra. It acts, therefore, as a wedge, stretching the contracted ring as it passes through. More rarely it is employed to exercise the muscles surrounding the urethra by causing them to contract and thereby giving them tone and strength. A bougie has no internal opening or eye, although it is frequently hollow. It may be said, like the catheter, to have a shaft, an external and internal end, and a point. It is made either of metal when it is stiff and unyielding, or of some more flexible material (soft bougies).

As an exercising agent.

Bougies have no eyes though divided into external and internal ends, shaft and point.

Metal and soft bougies.

A metal bougie is solid and tapers.

A **metal bougie** (fig. 11) is similar in general outline to a metal catheter possessing a special curve. It is made of solid steel plated with silver, but instead of remaining the same size, tapers gradually from the point throughout the whole curved portion of the shaft, and then continues of the same diameter to the external end. For example,

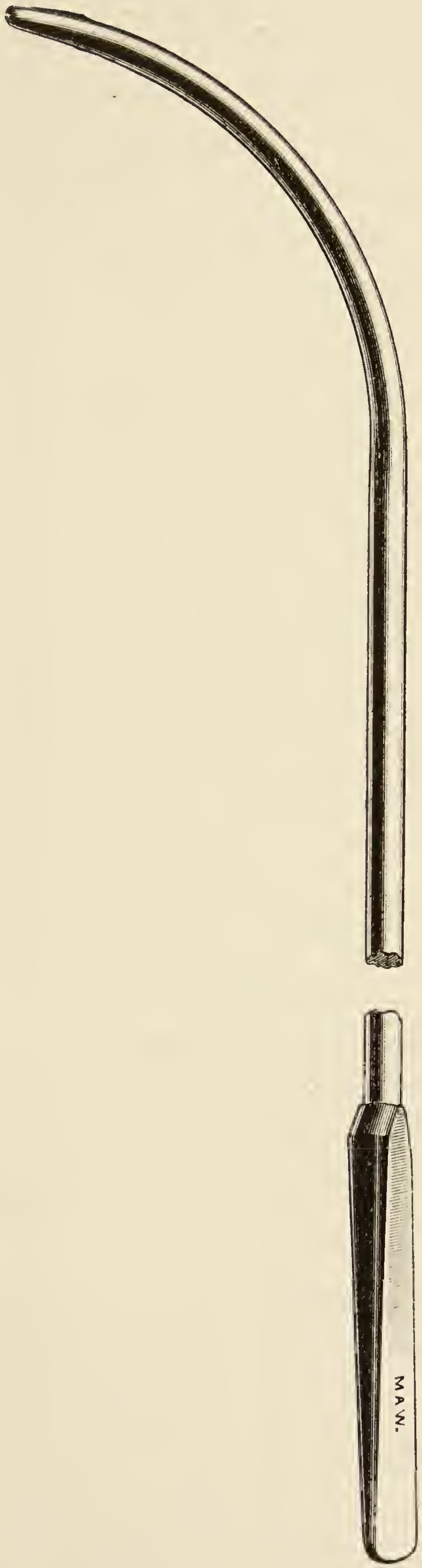


Fig. 11.—A metal bougie or conical metal dilator

if the point is equal to a No. 6, the size will have gradually increased to a No. 8 or 9 where the curve passes into the straight. From this characteristic the instrument is sometimes termed a *conical metal dilator*. The external end terminates in a solid flat handle which adds considerably to the weight, a necessary adjunct, aiding in the easy manipulation, and marking the position of the curve when in use.

Consequently termed conical steel dilator.

The handle and its use.

The **soft French taper bougie*** (fig. 12), such as is now generally used, rather resembles the olivary catheter, but the neck is much longer and the increase in size is in consequence much more gradual. The shaft varies very much in stiffness, though it is never as flexible as indiarubber, or in fact as the general run of soft catheters. One inch and a half of the internal end should always be quite supple and doughy, to allow the instrument to find its way through a difficult stricture without harm. If this point is attended to it may be found necessary, when the olive and neck are through the narrowing, to increase the rigidity of the shaft, so that the operator may be able to bring rather more pressure to bear. A wire or lead core inserted into the hollow will effect this purpose, but it should be withdrawn as more and more of the instrument passes the obstruction.

The French taper bougie. Its shape.

Its flexibility.

The internal end.

How to stiffen the shaft.

The **English bougie** (fig. 13), now rarely used, is the counterpart of the English gum catheter. It is easily moulded into any shape by using hot water, and retains the desired curve when cold. It has no

The English bougie.

Its shape, easily moulded without stylet, and differs from the French bougie.

---

* They are of course often made in England, and these usually stand the action of boiling water.

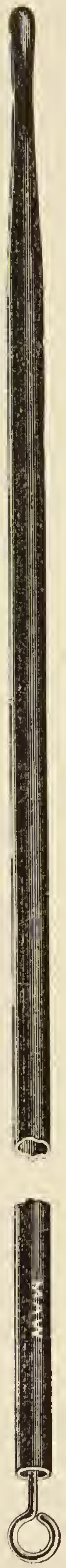


Fig. 12.—A soft French taper bougie with lead stylet.

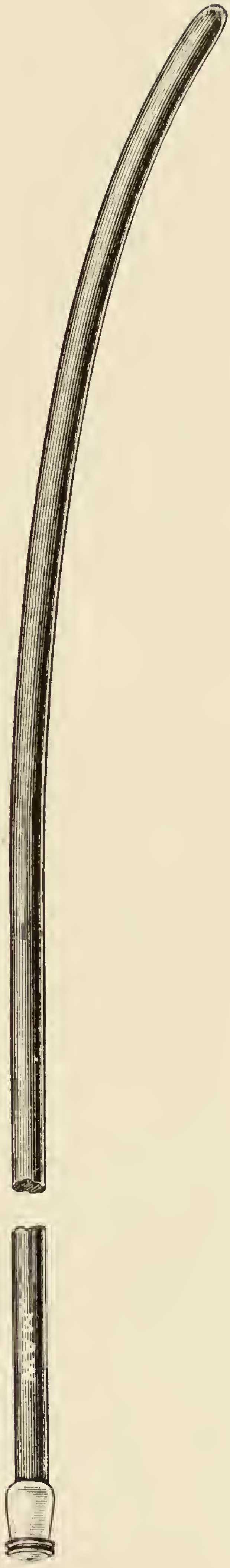


Fig. 13.—An English bougie

wire stylet, and differs from the French tapering ones in being nearly the same size throughout, in having no olive point or neck, and in being a good deal stiffer.

HINTS ON THE SELECTION OF BOUGIES.

Medical man to decide shape and kind. Conical steel dilators preferable.

What has been said relative to the selection of catheters applies also to bougies. Conical steel dilators are undoubtedly most efficacious, and add nothing to the risk, when the patient has thoroughly mastered the art of passing them gently and well.

Surface.

The surface should be kept bright, and polished, and free from dents and scratches.

Soft taper bougies: points in choosing.

In choosing soft taper bougies attention must be paid to the surface, and the flexibility, particularly of the internal end, which should taper very gradually. Boiling water should not blister or crack them.

Putting them away.

Measurement.

Sizes best suited.

After use they should be washed, dried, and put away quite straight. The scale for measuring them is the same as for catheters, and the sizes generally used by stricture patients, after treatment by the surgeon, are *10, 11, 12,* English scale, *or 18, 19, 20, 21*, on the French gauge. Patients will rarely be called upon to pass larger bougies, but under special conditions they may of necessity be a good deal smaller.

THE QUESTION OF REPAIRING OR REPLACING OLD CATHETERS AND BOUGIES.

Catheters and bougies like everything else wear out in time with use, and the question of how long a favourite instrument should be used before it is discarded requires a short notice.

When metal instruments should be repaired.

Metal instruments, when they are scratched or dented, or if they are rough to the finger and thumb, should certainly be sent to the instrument maker to be stripped and replated, as it is essential for their easy introduction that the surface should be maintained in a smooth and highly polished state. Stains and spots of rust appearing on the instrument after boiling indicate that the plating is getting thin and should be dealt with in a similar manner. With care, however, metal instruments will last for years without needing repair, especially if they are prevented from rubbing and knocking against one another, and are protected by wash-leather bags while stored.

When gum elastic catheters should be replaced by new ones.

Silk- and cotton-web gum-elastic instruments must be put aside as useless if they are rough or exhibit any apparent defects, for instance, chips from the point, the lips of the eye, or from the surface of the shaft, exposing the web beneath. Those that become sticky on being boiled should not be employed, but then these as a rule may be said to be badly made. The minute transverse cracks which appear on bending the instrument may generally be disregarded and will not necessarily render the instrument unfit for use, for they are entirely obliterated by the liquid vaseline used for lubrication. The life of gum elastic instruments depends largely on the way they are kept. As I mention later (p. 29), catheters which are constantly in use should be washed, dried, and put aside after a week or ten days wear, to allow the gum and the web to recover from the continued saturation and boiling. Good instruments will frequently wear for five or six months, even when used almost daily.

When indiarubber instruments are unfit for use.

Indiarubber instruments should be discarded as soon as they swell and lose their polish, also if they become sticky. They often increase in size very quickly, boiling them two or three times, especially in the presence of oily substances, being quite sufficient to produce a marked effect. They are then without polish, of a bright brick-red colour, often very difficult to pass, requiring much troublesome manipulation, and are liable to break. Another disadvantage is that indiarubber deteriorates if kept for any length of time, it loses its elasticity and becomes less flexible. No amount of warming or soaking will restore the natural qualities, and catheters are then decidedly dangerous as they easily snap with only slight extension. From these peculiarities indiarubber instruments require to be replaced much more often than other varieties, and in many cases will last safely only a few days.

(3) SYRINGES.

The form and use of the various syringes are dealt with on pp. 115 and 154.

CHAPTER II.

STERILISATION OF URETHRAL INSTRUMENTS, OR THE PRECAUTIONS TO BE TAKEN BEFORE THEY ARE USED.

Instruments dangerous for use unless surgically clean. Popular acceptance of the word "clean" totally insufficient.

BEFORE any instrument is fit to use it must be rendered surgically clean, which implies a very different state to that understood by the popular meaning of the word. Many patients would be quite content to wash, syringe, and dry it with a clean towel kept for the purpose and consider that everything had been done which could possibly be necessary. Of course such a proceeding is quite useless if we recognize the fact that every article employed—the hands, the cloth, and even the water, as well as the instrument itself—teems with microscopic vegetable organisms. Everything, unless specially protected, is invaded by these invisible germs, resting and waiting to be transplanted to a soil more favourable to their growth and multiplication. If they are transferred to the bladder and urinary passages under certain conditions, say by means of a catheter or bougie, they find at once what they require, a suitable soil, and commence to grow, giving rise to a local inflammation or cold. As their growth proceeds they manufacture poisonous products from the tissues and the urine, which being absorbed by the body, produce definite symptoms such as fever, shivering fits, pains, &c. When

Vegetable germs pervade everything waiting for favourable soil to grow.

Urine and urinary passages suitable to growth which produces inflammation and gives rise to poisonous products.

we consider the serious consequences following such inflammation, the importance of excluding the cause (the micro-organisms as they are termed) cannot well be exaggerated. It is imperative, therefore, before passing an instrument to be assured that all living organisms have been destroyed or removed, not only from the instrument itself, but, also from every part with which it may come in contact and by which it may be contaminated. This is surgical cleanliness or sterility, and it has to be strenuously enforced in urethral instrumentation if infection by these germs is to be avoided in regard :—

Essential therefore before instrumentation to destroy all life.

(A) To the instrument and the substance with which it is lubricated, and

(B) To the hands and penis.

On the instrument in the lubricant and on the hands and penis.

I shall now describe some easy methods by which surgical cleanliness may be obtained.

A. STERILISING THE INSTRUMENT AND LUBRICANT.

First Method.—All forms of vegetable life are killed by a sufficiently long exposure to a high temperature,[*] and it has been proved that water

Sterilisation by heat.

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[*] In relation to the question of what temperature of water will sterilise soft catheters, I will quote from the report of Dr. William G. Savage, Assistant to the Professor of Pathology at University College, London, who conducted a series of experiments for me to establish this point in 1899.

"In the following experiments catheters were soaked in a mixture of B. coli and staph. pyogenes aureus. They were then put into water at the required temperature for the time given. Then inoculations were made from their interior on to agar smears which were cultivated at 37° C.

at 150° F. will destroy the micro-organisms commonly met with, in half a minute. So an instrument exposed to its action for that time will be rendered free from all life and consequently safe to use. In actual practice, however, I allow a wider margin and always employ boiling water, which is easier to obtain, and I also let the instruments remain immersed a much longer period. Convenient cylindrical vessels or boilers, about two or three inches in diameter and sixteen inches high are made for the purpose (fig. 14). The boiler is filled with water to within three inches of the top and a tablespoonful or more of liquid vaseline* is poured on the surface. The whole is allowed to boil briskly over a fire or gas flame. If a soft instrument is to be sterilised it is totally immersed as soon as the vessel has been removed from the fire and while it is still boiling. To prevent the heat from damaging the surface, the catheter or bougie must be suspended by the ex-

The boiler.

Filled with water and liquid vaseline.

Sterilising soft instruments.

"Before each batch of experiments controls were made by cultivating from the catheter immediately before it was put in the hot water. In every one of these cases copious growth resulted.

Water at 150° *F.* (65·5° *C.*)

No. 1. Left in 20 minutes	Sterile.
No. 2. Left in 5 minutes	Sterile.
No. 3. Left in 2 minutes	Sterile.
No. 4. Left in 1 minute	Sterile.
No. 5. Left in ½ minute	Sterile.
No. 6. Left in ½ minute	Sterile.

"Water at 150° F., even for half a minute, is a reliable steriliser of catheters for ordinary work (that is, it would not in this time kil bacteria with spores, but these are not likely to be met with)."

* Paraffinum Liquidum of the "British Pharmacopœia."

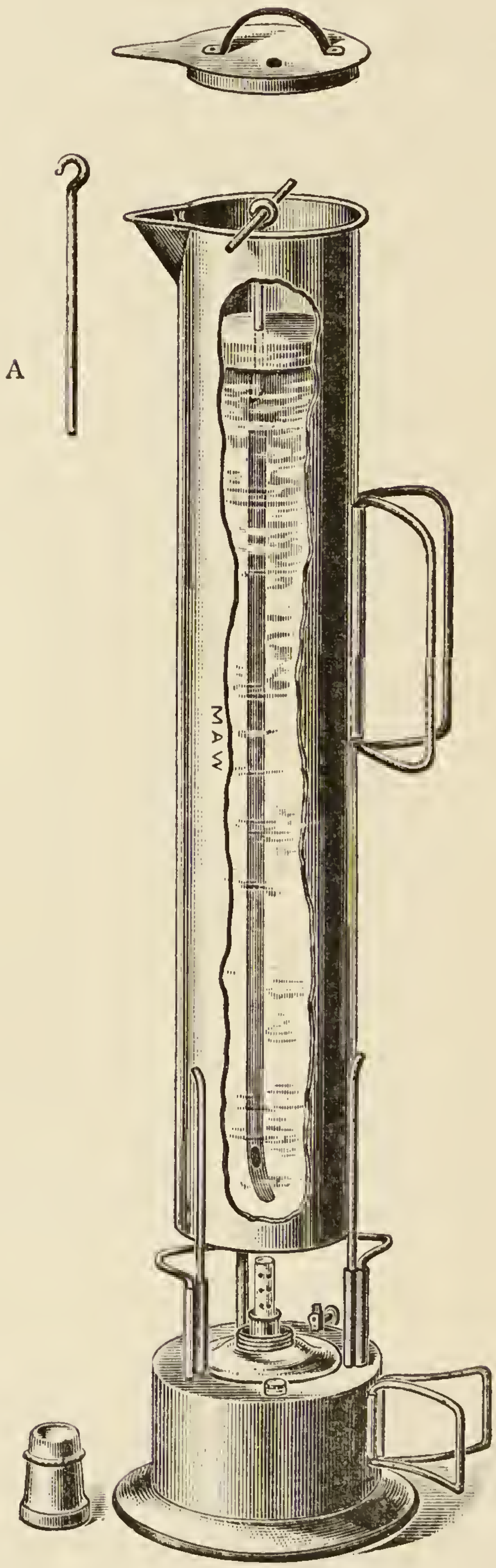

Fig. 14.—Cylindrical vessel for sterilising instruments filled with water and liquid vaseline and standing over a spirit lamp. It shows a soft catheter suspended in the fluid by a leaden wire hook A.

ternal end, so that it hangs in the fluid without bend or twist and the point quite free of the bottom. This is easily accomplished by pushing three or four inches of lead wire into the interior of the catheter or hollow of a bougie (fig. 14 A). The outer end of the wire terminates in a hook, which rests on a transverse bar at the top of the vessel (fig. 14). After the instrument has been immersed for a minute or so it is withdrawn by holding the wire between the finger and thumb of the left hand. The surface of the catheter will be found to be *uniformly lubricated* with a layer of liquid vaseline. The wire is pulled out as soon as the right hand is holding the catheter

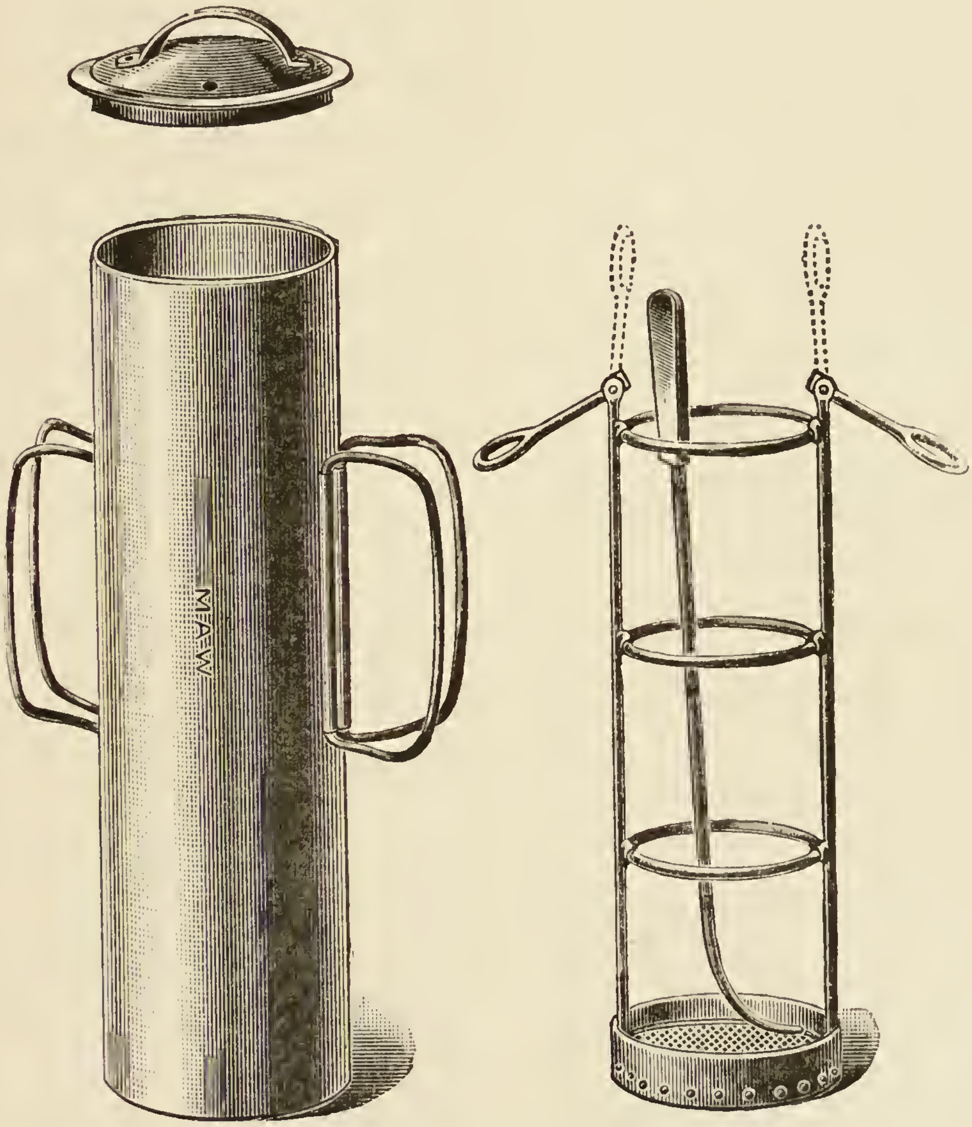

Fig. 15.—Cylindrical vessel with elevating tray for sterilising metal instruments.

in the proper position for passing (fig. 31), and it should be used almost immediately, for soft instruments cool very quickly.

Sterilising metal instruments.

Metal instruments require a longer time to cool and must be prepared a few minutes beforehand. In the place, therefore, of the transverse bar the boiler is fitted with a long loosely fitting tray or elevator, which can be removed at pleasure. The metal instruments are placed in this elevating tray (fig. 15) and the whole plunged into the fluid. After sufficient time has elapsed two or three minutes the tray with its contents is removed by suitable handles, and allowed to stand aside for three or four minutes on an ordinary dinner plate to cool. The instruments are prevented from touching any of the surrounding objects by the special construction of the tray.

This method suitable for occasional instrumentation.

Second method.—The above method of sterilisation is quite convenient for those who require an instrument occasionally, but when catheterisation is required four or five times in the twenty-four hours, and especially if it is necessary at night, it is most difficult to arrange. I have, therefore, designed a little apparatus which will enable a patient or an intelligent servant to prepare ten or twelve catheters in less than half an hour, and leave them ready sterilised for future use.

Method of sterilising and preserving catheters for future use.

Apparatus.

The apparatus (fig. 16) consists of:—

1. Series of metal tubes.

1. A series of metal sterilising tubes (D E) open at both ends, nickel-plated on the inside as well as on the outside, fourteen inches long and three-eighths of an inch in diameter. The central portion is covered with an insulator (D), and the ends are

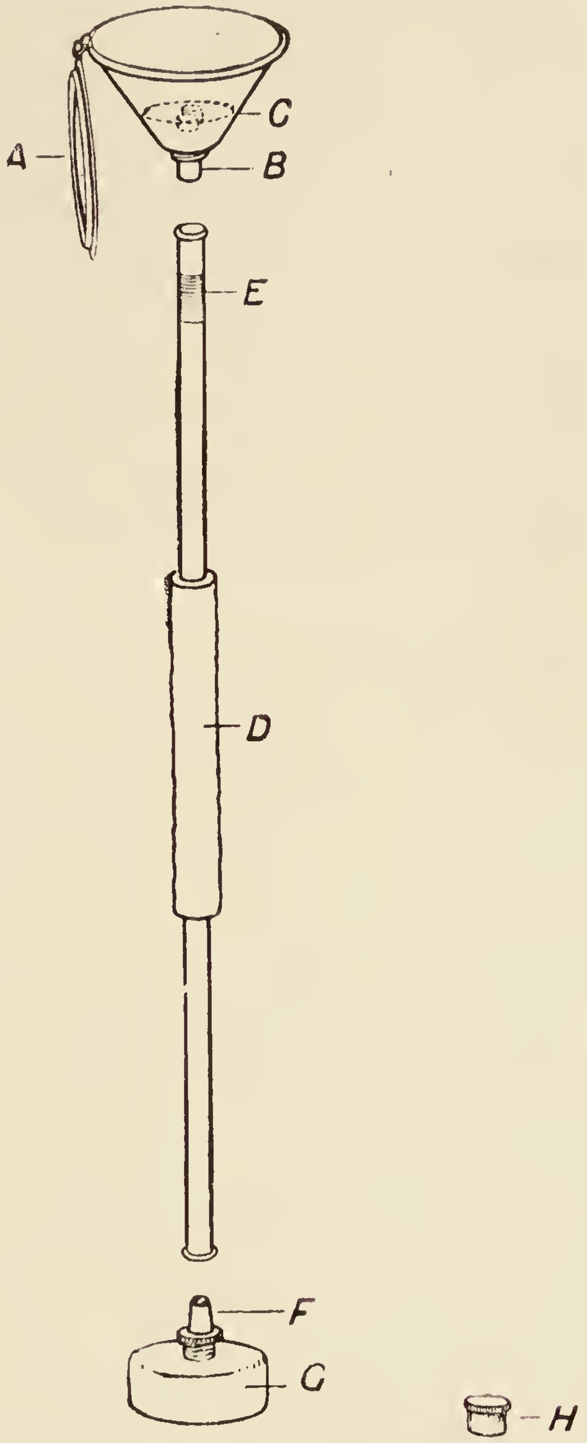

FIG. 16.—Sterilising apparatus. A B C, funnel, with lid, neck and diaphragm. D E, the tube the central portion covered with felt. F G, the flask. H, the cap to fit over the neck of the flask when not in use.

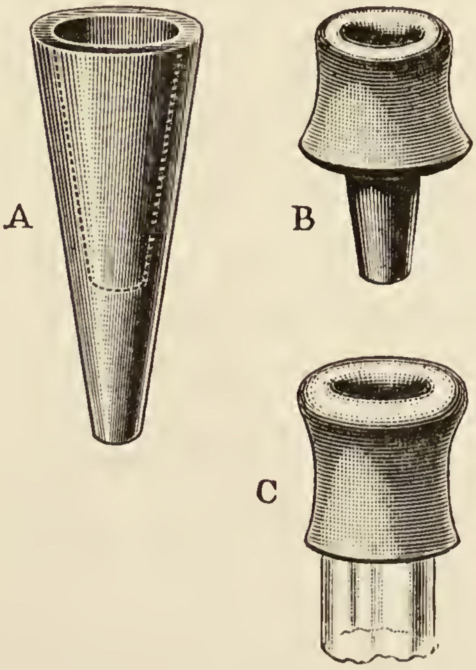

FIG. 17.—Indiarubber plugs for stopping the ends of tubes containing catheter. A, open. B. folded. C, inserted into end of tube.

fitted with rubber stoppers or plugs shaped like funnels (fig. 17). When in place the outer lip of the plug is doubled over the margin of the tube, making an exceedingly close fitting joint (fig. 17 C). Each tube, which serves the purpose of a case, contains a catheter, and is marked at one end with transverse lines (E), to indicate the top, the point of the catheter when inside being towards the bottom.

2. A funnel.

2. A small funnel (A B C) with a short tapered neck (B) which fits easily into the top of a tube. Its mouth is protected by wire gauze stretched across, which prevents the upward displacement of the instrument while being sterilised. The funnel is furnished with a loosely closing hinged lid (A), and inside near the bottom is a second diaphragm (C) made of wire gauze, in which are two circular holes to receive the rubber plugs to be sterilised.

3. A flask.

3. A watch-shaped flask (F G) which holds six teaspoonfuls. Attached to the upper surface at the centre by a screw joint is a neck (F) similar in construction to that of the funnel, which can readily be joined to the bottom of the sterilising tube, wire gauze preventing any instrument dropping into the flask. It is also supplied with a cap (H) to act as a stopper.

The way to use the apparatus.

Filling the flask.

When the apparatus is required for use the first step is to fill the flask with water and liquid vaseline.* A syringe supplied for the purpose is charged by sucking up a teaspoonful of liquid vaseline and then as much water as it will hold. The cap (H) is removed, the nozzle of the syringe is inserted into the neck of the flask and the mixture of water and vaseline injected. The plugs are then removed from the ends of the sterilising tube containing the catheter, and doubled up as in fig. 17 B. The funnel with the lid open is dropped into the upper end of the tube, and the folded plugs are placed side by side in the holes in the diaphragm (fig. 16 C). The lower end of the tube is now firmly fixed to the neck of the flask. The junction is made firstly by allowing the tube, when lightly held perpendicularly to slide as far over the neck as it will by its own weight. Secondly, by pressing the tube—now grasped in the right hand for this purpose by the insulated portion—on to the neck and at the same time giving the former a screwing movement from right to left, while the flask is held in a cloth between the finger and thumb of the left hand. The whole apparatus is then held perpendicularly by the insulator, so that the bottom of the flask is over a spirit or gas flame. In a short time the water boils, and some is forced up through the tube into the funnel, there covering the plugs. As soon as it boils rapidly in the funnel the apparatus is removed and allowed to stand on a cloth, to permit the water to return into the flask. The operator's time may be occupied by withdrawing and preparing the plugs of the tube next to be sterilised. The tube and the flask are now disjointed in precisely the same way as they were united, but instead of the downward pressure the tendency should be to separate the parts while giving the same screwing movement from

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* Paraffinum Liquidum of the "British Pharmacopœia."

Joining the funnel and the flask to the tube

Boiling the apparatus.

Disconnecting the various parts and plugging the tube.

right to left. The lid is opened and a plug is taken out and inserted into the bottom of the tube and pushed well home by pressing it firmly on the table. The funnel is lifted off and the remaining plug pushed into the top. *Thus the inside of the tube, the plugs, the lubricant, and the catheter, which is now well-coated with oil and needs no further lubrication, and will not slip from the case, have all been rendered clean, and will remain so, without harm to the instrument, for some days.* The cleansing of the next catheter is then proceeded with, though the time taken will be less, as the water is already near boiling point. Twelve catheters—a store sufficient to last at least forty-eight hours—may be prepared in twenty minutes by any intelligent servant, and thus save much time and inconvenience. If the tubes and catheters are new and quite dry the flask must be replenished with liquid vaseline after six have been cleansed, but when once they are in good working order and thoroughly greased, many more may be prepared without further addition, though a small quantity of water should be added from time to time, especially if any is spilt in manipulation. It is advisable to empty the flask after use, and to commence from the beginning the next time the apparatus is required, though of course it may be put away ready charged—after replacing the cap—if it contains sufficient lubricant and water to perform its duties satisfactorily. When a catheter is required for use the top plug, that is the one near the transverse markings (fig. 16, E) is unfolded and pulled out, and the instrument shaken to that end, by giving the tube one or two smart taps while

Replenishing the flask.

Emptying the flask.

Making the catheter present.

holding it by the *further end*, until sufficient appears to allow of its being withdrawn (p. 41, par. 6). After use it is returned to the case without any washing, the urine being simply shaken from it, to be sterilised at a convenient time, the plug being replaced but this time without folding it over. Some patients use the apparatus every time they require an instrument. The process is shortened as the plugging is dispensed with and the instrument is at once shaken from the tube after the funnel and flask have been removed.

Returning the catheter after use.

Using the apparatus at the time a catheter is required.

The flask, the tubes, the funnel, and the plugs, must be kept free from grit and pieces which might be deposited on the catheter during sterilisation. It is essential also to occasionally wash the apparatus with soap and water,* and to polish the inside of the tubes by means of a piece of dry cotton wool attached to a string. The catheters after a week's constant wear should be similarly treated to remove the grease, dried and put aside for a couple of days to allow the gum, with which they are made, time to recover from the effects of boiling before being employed again.

Washing the apparatus and the catheters.

The apparatus may also be employed to sterilise flexible bougies, but if large ones are used, say Nos. 10, 11 and 12, the internal diameter of the tubes must be increased to allow of the free passage of the water and liquid vaseline when boiled.

Sterilising soft bougies.

To simplify the manipulation I have more recently designed a holder (fig. 18) for this apparatus. It consists of an upright tube (*HH'*) about 14 inches

The holder for the sterilising apparatus.

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* Hudson's extract is an excellent soap for cleansing all instruments, and is the one I generally use.

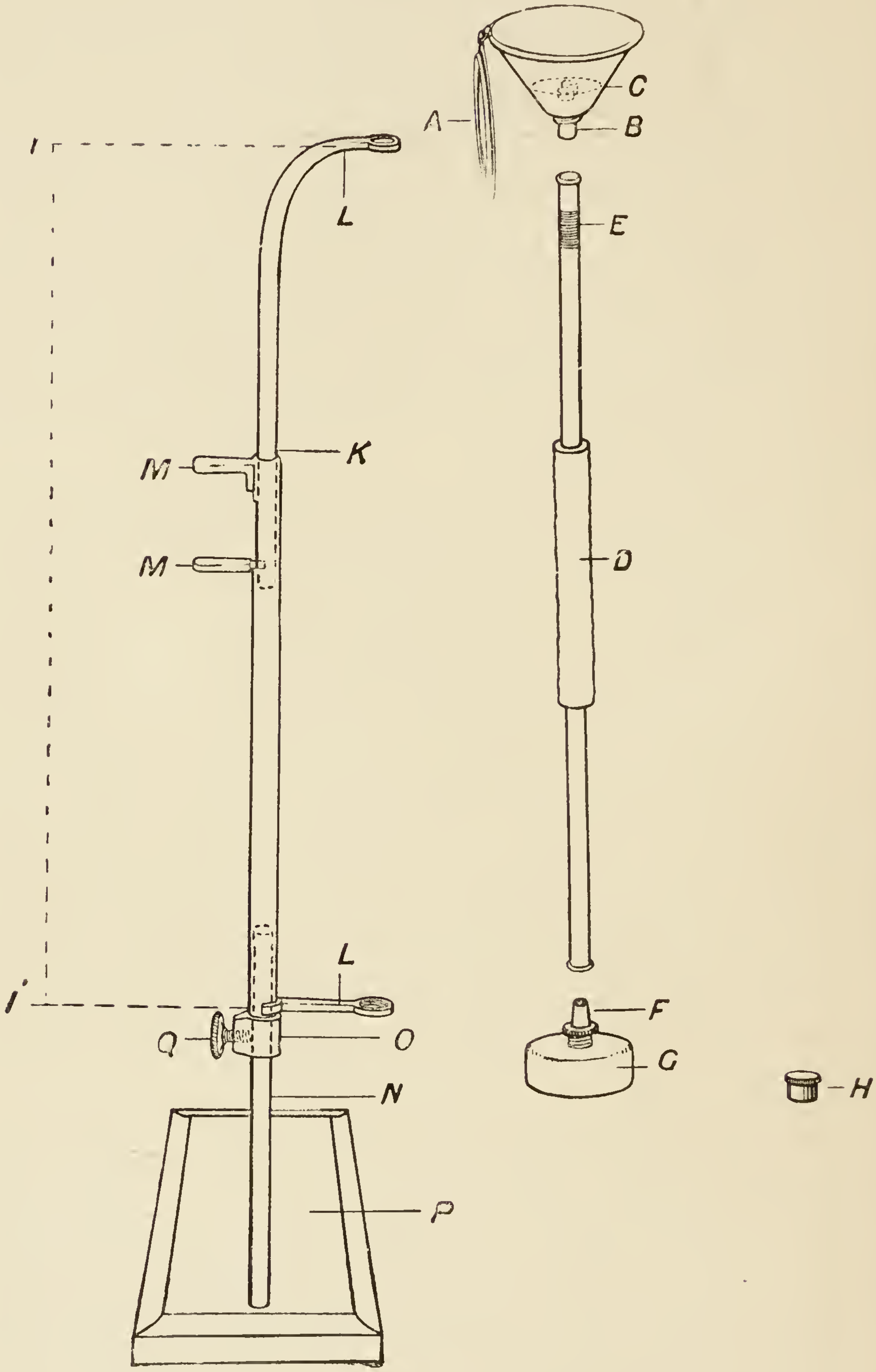

FIG. 18.—Frame for holding sterilising apparatus. I I′, upright tube carrying upper and lower arms L L. K, telescopic joint. M M, side handles to elevate funnel. N, solid perpendicular bar fixed to stand P; over its upper end passes the lower end of the upright tube I I′, the distance being regulated by the block O, which is fixed by the binding screw Q.

long, carrying at each extremity an arm (L L) bent at right angles. To the outer end of the upper the funnel (C) is screwed, and to the lower the flask (G), so that the necks (B and F) of each are directly above one another and separated by 13 inches. There is a telescopic joint (K) about the middle of this upright, which allows the upper section to be raised at pleasure by pressing together the two small side handles (M M) provided. The bottom of the upright tube passes for an inch or so over the top of a stout bar (N) fixed perpendicularly to a firm base (P), but is prevented from passing too far over by the stop (O) which is fixed in any position on the bar (N) by the binding screw (Q). The holder bearing the flask and the funnel can thus be swung round freely in a horizontal direction and the flask brought over a flame when desired.

Method of using steriliser with holder.

The flask (G) is filled with water and liquid vaseline in the ordinary way, while it is turned away from the flame. The bottom of a sterilising tube is put lightly over its neck (F) and brought into an upright position. The side handles (M M) are pressed together with the right hand, and the funnel raised sufficiently to let its neck (B) drop into the marked end of the sterilising tube (E, also fig. 19). The whole apparatus is now held together by gravity, and can be brought over the flame to boil. Afterwards it is again turned aside to cool, and when the fluid has returned to the flask (G) the sterilising tube (D E) can be removed by gently pressing the side handles (M M) together, and, at the same time, giving the tube a slight turning movement from right to left with the left hand. If the tube has to be plugged for future use precisely the same method is adopted as before.

Bacteriological tests of apparatus.

The sterilising apparatus above described was tested from a bacteriological point of view by Mr. Lenthal Cheatle and I herewith append his report :—

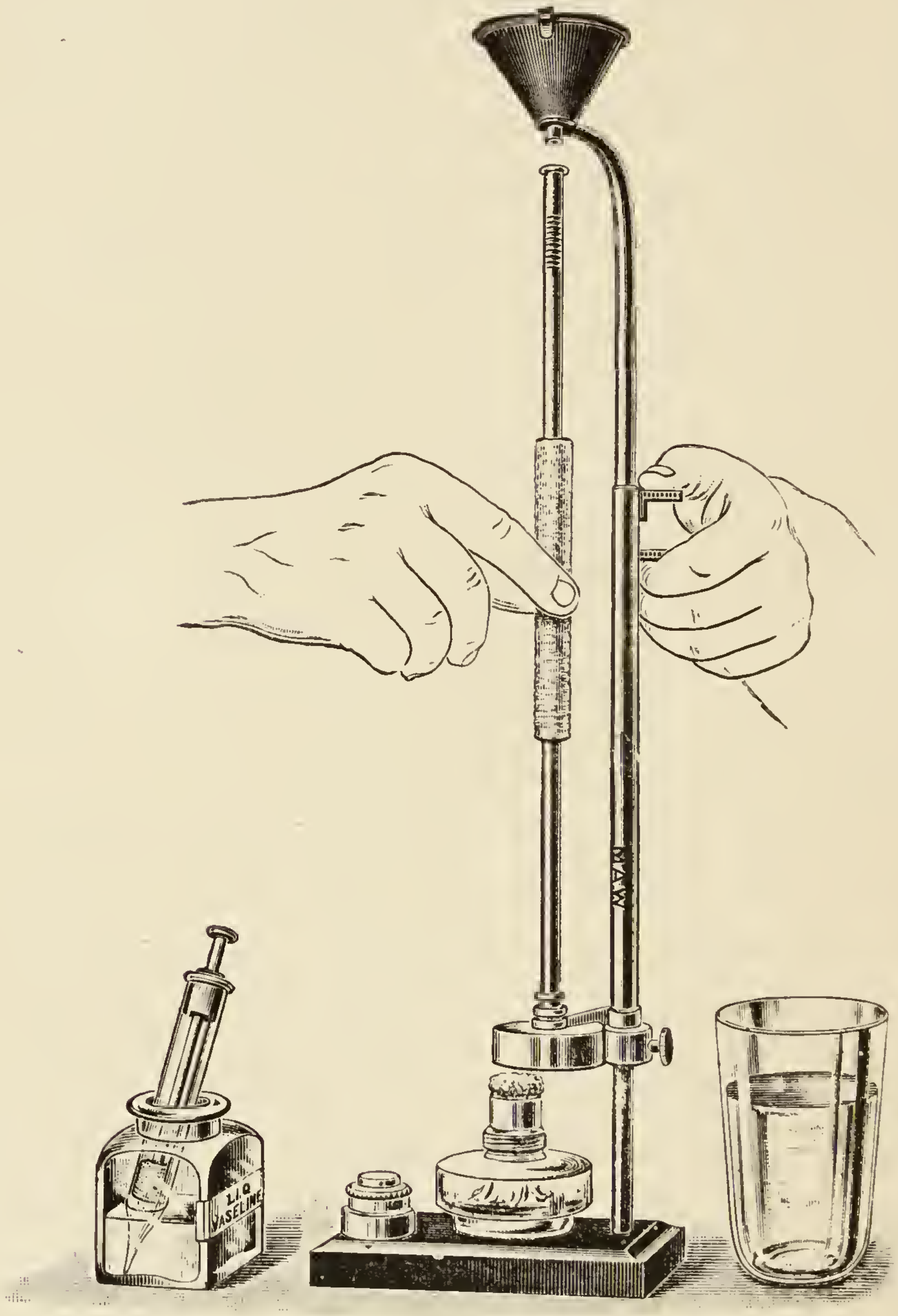

FIG. 19.—Joining sterilising tube containing catheter to frame while turned aside from spirit lamp.

Mr. Cheatle's report.

"There can be no doubt that this method sterilises catheters, and in being sterilised by this method they suffer no appreciable harm.

"To test these statements I performed the following experiments :—

"Catheters were infected by bouillon cultures of a staphylococcus pyogenes aureus and bacterium coli commune in pure and in mixed cultures. Infection was made by filling the tube of the apparatus and the catheter within it with the infected medium, so that by shaking the whole the contained catheter became thoroughly septic. The culture was then poured off, and the tube with its contained, now septic, catheter was attached to the flask, and boiled as directed for fifteen seconds.

"After the subsidence of the boiling fluid, the tube with the catheter was allowed to cool. Now the tube was converted into a test culture tube by pouring into it sterilised germ-free bouillon, which was kept from leaking by dipping the rubber-plugged ends of the tube into a paraffin which melted at 52° C. and which upon cooling formed a film over all possible means of exit.

"Catheters were kept up to three weeks in this fluid, and, as no infection of it occurred, I presumed the instruments were sterile. The rubber plugs were subjected to the same tests, and successfully survived the ordeal. Every now and then a failure would occur, probably due to an error in bacteriology.

"At first I tested excised segments of the sterilised catheters, and plunged them into the ordinary test tubes for media. Then failures repeatedly occurred. Exposure to the air during the excision of the segments was the source of infection, in spite of careful preparations to prevent it. However, the

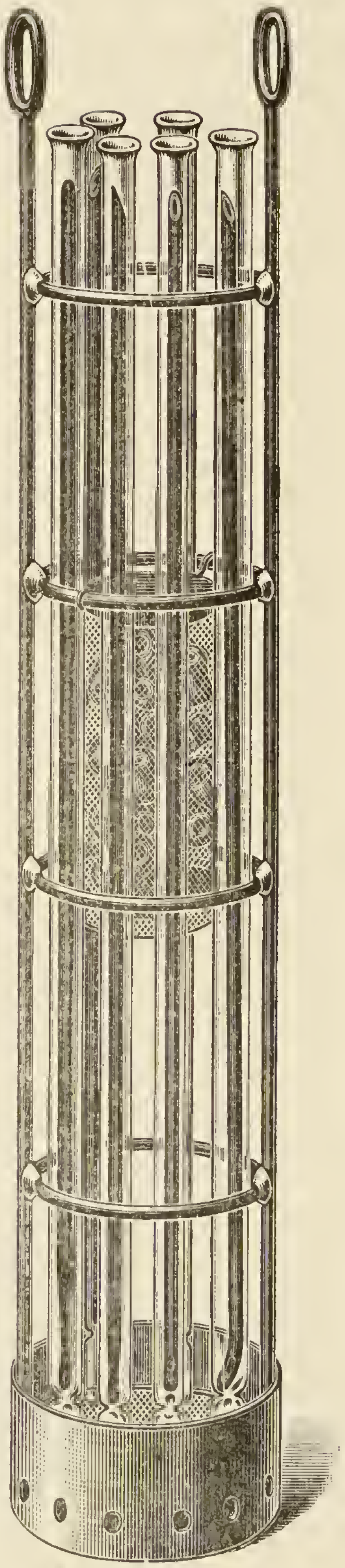

Fig. 20.—Elevating tray similar to that used in figure 15, but enlarged. It is carrying glass tubes containing catheters, also wire basket with rubber plugs, ready for immersion in the cylindrical vessel or boiler.

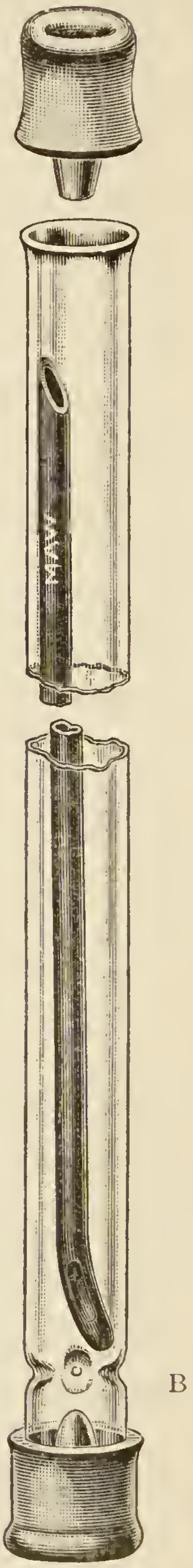

Fig. 21.—Glass tube containing catheter. A, funnel-shaped mouth. B, constriction. The lower end is already plugged.

adoption of the tube in which the catheter was sterilised first as an infecting chamber, then as a sterilising chamber, and finally as the medium's test tube, was a more accurate conception of testing the efficiency of the apparatus."

Apparatus.

Third Method.—**Another method of sterilising soft instruments,** and one which is often preferred, as it requires no special knowledge, is the following :—The apparatus required is :

1. The cylindrical vessel such as I have previously described (fig. 14), with the elevating tray, an enlarged sketch of which is given in fig. 20.
2. A series of glass tubes. Each tube (fig. 21) is about two inches longer than and of sufficient diameter to hold an instrument easily. Both ends are open and rather funnel-shaped (A). An inch from one extremity the diameter is slightly contracted (B) to prevent the catheter or bougie passing out in that direction.
3. A sufficient number of plugs to stop the ends of the tubes after sterilisation (fig. 17).
4. A wire basket with hinged lid (fig. 22) to hold the plugs during the process, and which can be attached to the elevating tray when desired.

Method

An instrument is dropped into a tube and its *point* allowed to rest on the constriction (fig. 21 B). All the tubes when filled are allowed to stand upright in the elevating tray, constricted end downwards (fig. 20). The basket (fig. 22) containing the plugs is hooked on to the supports of the tray and the whole slipped into the boiler (fig. 14). The vessel is then filled with water—hot water, if the instruments are wanted quickly—and half an inch of liquid vaseline floated on the surface. The lid is replaced and the apparatus put on the fire to boil. After it has boiled briskly for a minute the elevator is removed and allowed to stand on a cloth. The basket containing the plugs is unhooked and opened, and a rubber plug is pushed into either end of each of the tubes in the same way as before (figs. 17 and 21). Afterwards the tubes are dried, and are then ready for use hereafter. Metal tubes are made for patients who require to carry instruments in their pockets.

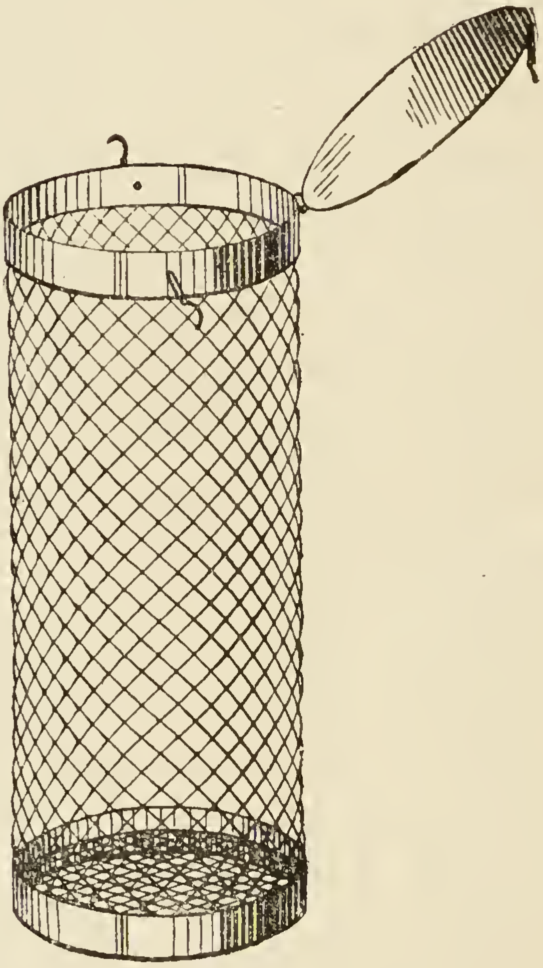

FIG. 22.—Wire basket with hinged lid to hold the rubber plugs, and which is hung in the elevating tray when boiled.

CHAPTER III.

B. Preparation of the Parts previous to Instrumentation.

The cleansing of the hands and the penis must necessarily immediately precede the introduction of the instrument, and I here give the various steps in the order in which they should be undertaken when an instrument is to be passed.

Firstly.

General preparation.

1. **Everything that is wanted for the operation should be ready,** and although full details are given relative to each in the following paragraphs, it is well to enumerate what may be required. *The instrument*, whatever it is; if a flexible catheter previously prepared in a tube, the plug should be withdrawn from the marked end, and the catheter just made to present (p. 28), the tube being laid so that nothing can touch the exposed end (fig. 23); if an instrument sterilised by suspension in the boiler, the lid should be taken off; and if a metal bougie or catheter cooling, the elevator containing it. All should be so arranged that the instrument can be removed from the apparatus, when the fingers have been cleansed, without any further interference. *The vessels*, the small basin in which the penis is washed, the chemical solution (note paragraph 4) for the fingers, the cloth to protect the trousers, and, if catheterisation is to be performed, a chamber or measure glass standing on a convenient stool or chair to catch the urine withdrawn (fig. 23).

Apparatus required:

(*a*) The instrument.

(*b*) The vessels.

(*c*) The cloth.

(*d*) A glass measure on stool to catch urine.

Secondly.

Adjustment of clothes.

2. The **clothes** should be thoroughly freed and adjusted, so that nothing can touch the organ or come in the way of the instrument, or require any attention afterwards. If the patient is dressed it is well to protect the trousers with a cloth or paper square.

3. The **foreskin** should be withdrawn and kept so, and when possible urine should then be passed in a good stream to flush out the passage.

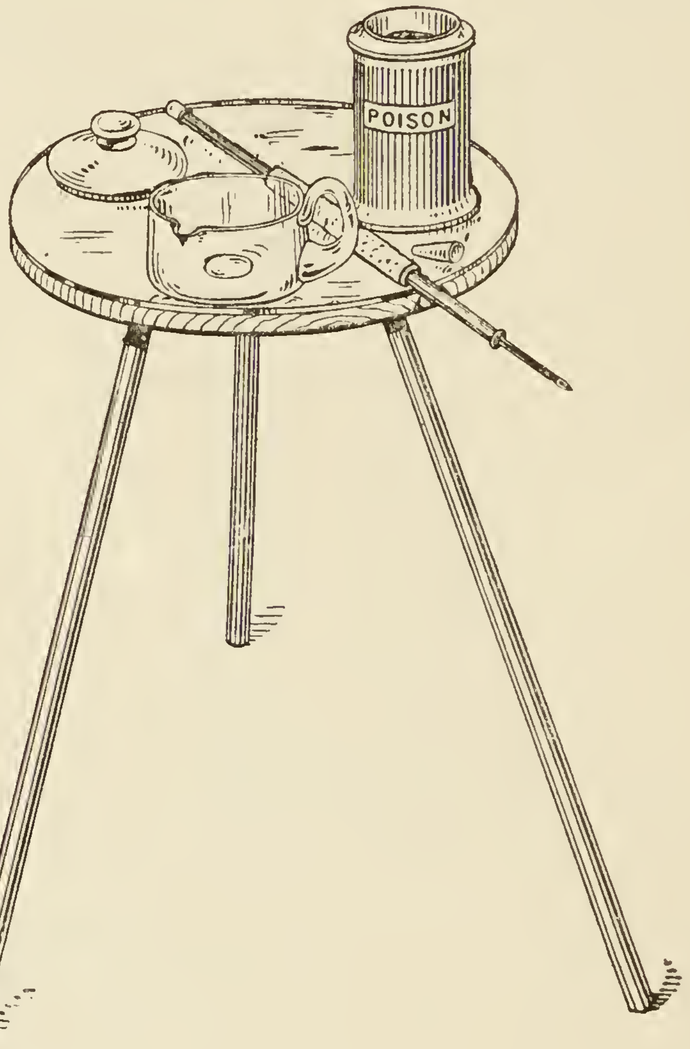

FIG. 23.—Preliminary preparations for passing a catheter. Glass topped stool with jar containing wool or gauze soaking in antiseptic solution. Glass bowl to catch the urine, and sterilising tube with the catheter presenting.

Thirdly.

Micturition.

Fourthly.

Washing hands and rubbing with chemical solution.

4. The **hands and the nails** should be well scrubbed with soap and water, and at once, without drying, well rubbed with a piece of gauze or wool moistened with the chemical solution.

Note:—For this purpose it is convenient to keep pieces of cotton wool soaking in a covered vessel, containing either 1 in 1000 mercuric potassium iodide,* or 1 in 1000 perchloride of mercury,* or a 2 per cent. solution of lysol, or as recommended by some a solution of purified soft soap in spirit. I prefer the iodide, the lysol, or the soap, as they do not attack metals very readily, but the last named requires to be washed off with sterile water, though it possesses the advantage of dispensing with the preliminary cleaning.

Fifthly.

Washing the penis, and rubbing with a piece of cotton wool dipped in the chemical solution.

5. The **penis,** from which the foreskin has already been withdrawn, is well washed with soap and water, or with the spirit solution, particular attention being paid to the lips of the orifice, which should be separated with the finger and thumb for the purpose. The tip and inside the lips of the penis is finally *rubbed* with the antiseptic solution.

Sixthly.

Rubbing the fingers aga with the chemical solution.

6. The **fingers are again rubbed** with the chemical solution, and afterwards nothing whatever should be touched except the catheter and the penis. If such an accident should happen they must be well rubbed with the moist wool.

Modification of preceding rules.

Naturally, a patient who passes a catheter many times a day, cannot carry out these precautions when engaged away from home or under unfavourable circumstances, as must frequently occur if he is actively employed. Yet it must be impressed upon him that he is amply repaid for any trouble and care, if he can avoid so serious a complication as an attack of inflammation, or other septic troubles.

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* Messrs. Burroughs make a 8·75 grains soloid, which when dissolved in a pint of water gives the required strength.

The rules already laid down, which are more especially for patients who pass instruments occasionally, although they should not be relaxed beyond a certain point must be modified to meet his needs. I have, therefore, formulated a scheme which, if taught and carried out in conjunction with the hints on the manipulation of the catheter itself (p. 55), on which I also rely, will prevent infection taking place.

Washing the penis.

In the first place he should make it a rule to wash the penis with soap and water very thoroughly, every night and morning, and should carry with him a tube, containing a sterilised catheter in a long pocket made expressly for the purpose in the lining of the breast of the coat. He should also be provided with a metal box containing several pieces of gauze soaked with some chemical germicide (note paragraph 4 *ante*).

Apparatus to be carried by patient.

Tube containing catheter and metal box.

When the catheter is required :—

Preparation immediately before using the catheter.

1. The patient takes the tube from his pocket removes the plug from the marked end of the tube and shakes it, so that about two inches of the cut end of the catheter presents (p. 28). The tube is laid down near at hand, but the exposed end of the catheter should not touch anything. The metal box containing the moist gauze is also placed open beside him (fig. 24).

The box.

The clothes.

2. The **clothes** are adjusted (p. 38, par. 2).

Micturition.

3. The **foreskin** is withdrawn and the patient passes water if he can (p. 38, paragraph 3).

Cleansing fingers.

4. The **fingers** are thoroughly *rubbed* with a piece of gauze which is then thrown away.

Cleansing penis.

5. The tip of the **penis** is cleansed with a second piece which is also thrown away.

Removing catheter from case and the way to hold it correctly.

6. The **catheter is withdrawn** from the tube in the following way. Take hold of the catheter one inch and a half from the "slant" with the forefinger and thumb of the right hand, and withdraw half its length (without holding the tube). Relax the grasp, and in the same way take up a fresh hold in the middle of the catheter, but *without touching the intermediate surface*, and remove it from the tube entirely. The catheter should now be held ready for passing, with the slanting cut end directly facing the patient (fig. 31), and should require no further shifting between the finger and thumb after it is once withdrawn.

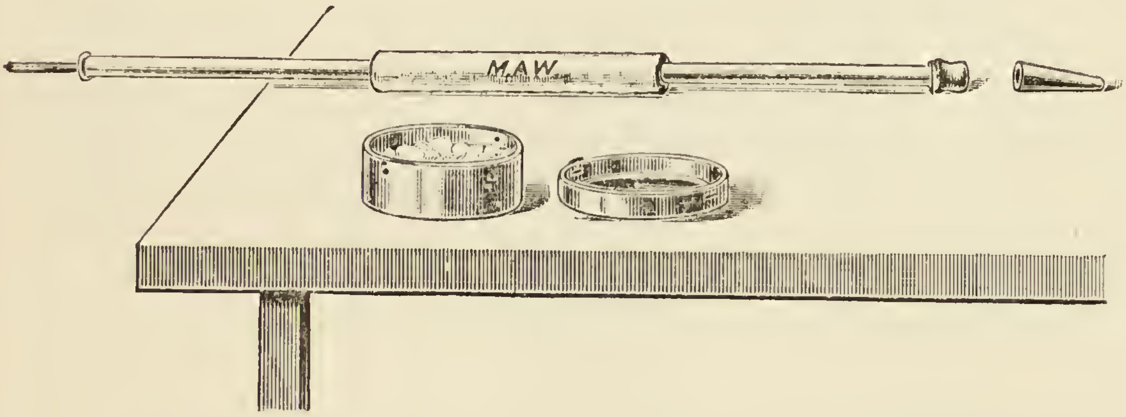

FIG. 24.—Pocket outfit for catheter patient. Metal box containing moistened wool and tube holding sterile catheter ready to be withdrawn.

Cleaning all appliances.

Patients should be directed to keep the appliances mentioned in this chapter *scrupulously clean*, viz., the box and jar containing the wool or gauze, the vessel to catch the urine, and even the stand on which it rests, having them periodically washed with soap and water, or what is better, when possible, boiled. Dirty cloths should never be kept; I prefer a clean piece of rather thin unglazed paper for wiping up any mess that may be made, which should be burnt immediately after it is used.

CHAPTER IV.

THE USUAL METHODS OF STERILISING URETHRAL INSTRUMENTS.

THE subject of sterilisation of urethral instruments, and the preparation of the parts will not be complete without some reference to the various methods now generally in vogue.

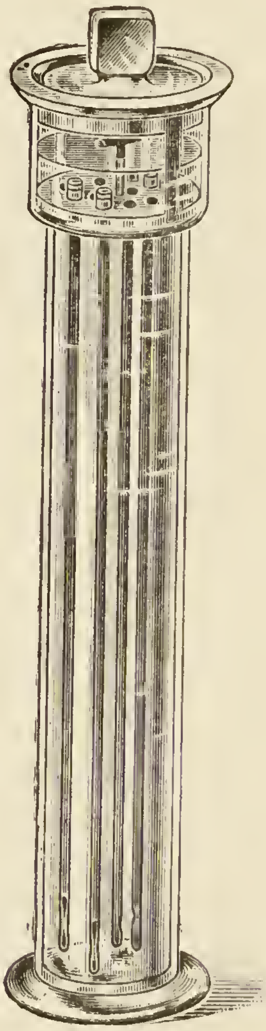

FIG. 25.—Glass jar containing antiseptic solution to sterilise instruments by immersion. This may also be used for formalin.

Sterilisation and lubrication performed at different times.

The attempt to sterilise the instrument and its lubrication are invariably performed in two stages, and I will deal with them in that order.

Sterility of instruments produced by chemical solutions.

Chemical antiseptics* are most generally relied upon to sterilise instruments, but oftentimes either the material or the strength of the solution used is anything but sufficient to produce the desired effect. Soft instruments which have been kept suspended for a considerable time, in long glass tubes (fig. 25) filled with a solution of 1 in 2000 perchloride of mercury, 1 in 20 carbolic acid, or in 2 per cent. solution of lysol are very probably sterile, but the chemical must be removed before their introduction, if pain and discomfort are to be avoided. They are, therefore, generally dipped or rinsed in a saturated solution of boric acid contained in a similar vessel. There are very strong objections to this method. In the first place the constant soaking very quickly cracks and destroys the instrument ; secondly, there is much manipulation which greatly increases the risk of infection, and finally boric acid is by no means an antiseptic, and most probably contains active micro-organisms, unless, of course, it has been quite recently boiled, under which circumstances plain water would do equally well. Perfunctory dipping

Disadvantages and dangers.

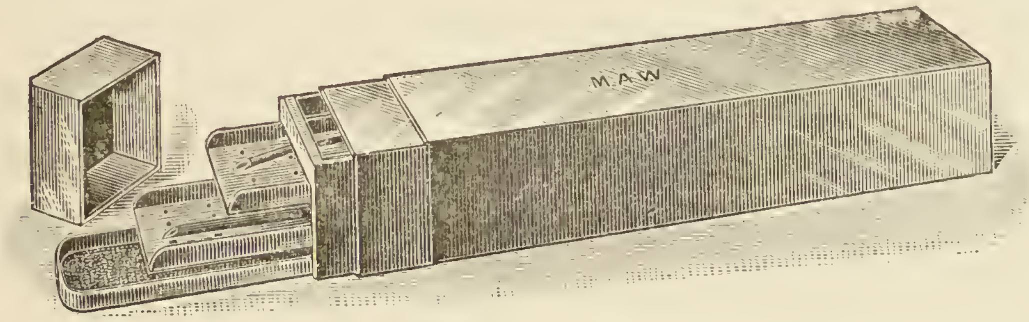

FIG. 26.—Apparatus for sterilising instruments by formalin.

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* The word "*antiseptic*" is used as an equivalent for germicide, and is not limited to its strict meaning of inhibiting or restraining the activity of organisms which cause putrefactive changes.

Useless method.

or immersing the instrument at the time it is required in antiseptics, as well as the employment of weak solutions, and such chemicals as boric acid, permanganate of potassium—which are only inhibitors of the growth, and not destroyers of the micro-organisms—are, of course, totally inadequate to produce sterility in any instrument, and should therefore be prohibited. Of late, instruments have been exposed for a considerable period to the action of trioxymethylene vapour (formalin), in air-tight metal boxes (fig. 26), originally designed by Gentile, of Paris, or in stoppered glass jars (fig. 25). The formalin is slowly generated from powder or tabloids, placed on a tray within the receptacle and is gradually deposited on all parts of the instrument to be sterilised. This process does not destroy the instruments so readily, and no doubt, judging from the large number of experiments made by Janet and others, is reliable from a bacteriological point of view, but even then although we have overcome one trouble the other remains, the adhering chemical must be removed from the surface, if it is to be used without causing urethral irritation. The one fact therefore—leaving out of consideration the question of their uncertainty, and the time they take to produce their effect—that chemical antiseptics strong enough to be efficient, must be removed from the instrument usually by an inert fluid, which, in its turn, must be freed from all living organisms by frequent boiling, and that very shortly before it is used, for I know of no other easy way of keeping the fluid sterile, appears to be a very great obstacle to their general employment as *sterilising agents* for urethral

Disinfection by vapour of formalin.

Reliable but irritating.

The principal reasons why chemical antiseptics should not be used.

instruments. Surely it is easier and safer to sterilise the instrument and the inert fluid together at the same time, and dispense with chemical antiseptics entirely.

The general objection to the use of boiling water untrue.

The reason, no doubt, why boiling water has not been generally used for this purpose is the often repeated statement that soft gum elastic instruments are rapidly destroyed by boiling. It is certainly not the case with those made by good makers in this country, provided one or two simple rules are adhered to. Thus, the instruments should always be suspended *perpendicularly*, in a vessel large enough to hold them without altering the shape and curve originally designed. When the gum with which the instrument is made is then softened by heat, the tendency is for it to slip evenly down towards the point, without causing any irregularities or breach of the surface. On the other hand, when the instrument is bent, transverse cracks appear on the convexity where the tension or stretching is greatest, and rugæ on the opposite where the gum is under compression. Of course, when the catheter is repeatedly boiled in the horizontal position the gum very gradually runs to the lower side, and moreover the sterilisation of the interior is not so certain, for the air cannot escape so readily as when the instrument is upright.

Precautions to be taken in boiling instruments.

Cause of damage.

Ward Cousins' steam steriliser.

Another very useful form of apparatus in which heat is employed as the sterilising agent is that suggested by Mr. Ward Cousins (fig. 27). It consists of a strong boiler in which steam can be generated under slight pressure, the amount being regulated by a safety valve. The steam escapes through a gradually tapering nozzle, three or four inches long. The external end of the catheter to be sterilised is pushed over the tip of the nozzle, and a current of steam forced through the instrument. This method of sterilisation is no doubt efficient, but it is hardly applicable for patients.

Modification. Recently I have made further experiments, and although I have not had time to test their efficacy they promise well. Instead of fixing the catheter directly to the nozzle, I put the instrument in a sterilising tube (fig. 18) with sufficient liquid vaseline to lubricate it, and then join the tube to the nozzle and allow the steam to blow through it for a few minutes. This simple plan has the advantage of sterilising the instrument and lubricant at the same time, and the latter is well applied. The catheter,

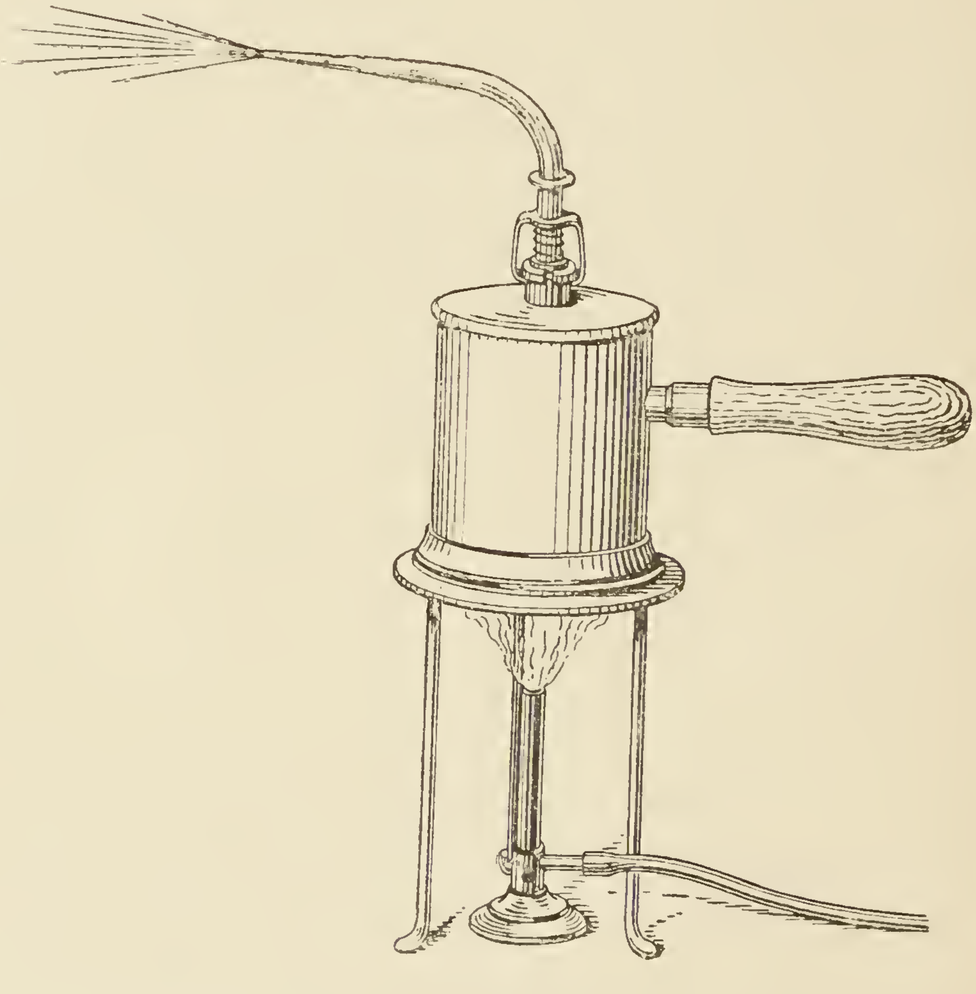

Fig. 27.—Ward Consins' steam steriliser (modified).

or flexible bougie—for the apparatus can be used equally well for sterilising that instrument—may be removed in its case, and placed in any convenient position for use without fear of contamination.

Composition of lubricants which are supposed to be rendered sterile by chemical antiseptics

Lubricants usually consist of vaseline (Paraffinum molle), animal or vegetable fats, and sometimes of soaps or glycerine. Their sterility depends, and is often supposed to be maintained for very long periods, on the presence of chemical antiseptics, carbolic acid being most generally preferred, though it has the great disadvantage of being volatile, and of possessing a greater affinity for water than for oily substances. Thus we find preparations containing it very quickly lose their antiseptic properties, and from its latter characteristic cause considerable irritation in the urethra when used. The addition of mild inhibitors of microbic growth as boric acid (Guyon's pomade), eucalyptus, &c., are totally useless to sterilise a lubricant or to maintain it in an aseptic state even after it has been sterilised by boiling. The use of all the above and similar preparations must be a source of considerable danger, and I think should be absolutely forbidden if infection* is to be prevented.

The addition of inhibitors to microbic growth useless.

All lubricants source of considerable danger.

Some authorities insist on the lubricant being solu-

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* The term "*septic*" is not limited in this little book to its strict meaning, *i.e.*, the presence of active saprophytic or non-pathogenic bacteria, but is used in a far wider sense as a convenient term to convey the fact that living micro-organisms contaminate the part or object named. The word "infection" is used in a similar way, and simply indicates that contamination with some kind of living micro-organism has occurred, and not that the living tissues have been invaded by parasitic or pathogenic bacteria. *Antiseptic* is used as an equivalent for *germicide*.

Soluble lubricants: their advantage over insoluble preparations.

ble in water, and therefore reject all fatty substances as unsuitable. The reason advanced is, that as it is impossible to free the urethra from the numberless micro-organisms which are said to exist there normally, many may be transferred to the bladder by the passage of an instrument, and their free escape from thence in the urine—certainly most desirable—is hindered by the presence of an insoluble lubricant adhering to the bladder wall and in which the microbes are embedded. With the idea of obviating this, glycerine, which of course is soluble in water in all proportions, has been recommended, though from personal experience I have found a good deal of urethral smarting and discomfort follow its use. A soluble lubricant is for many reasons no doubt preferable, and although I generally use liquid vaseline (Paraffinum liquidum) because it is an excellent lubricant, inert, and is not decomposed by heat, yet if a fourth characteristic, viz., solubility in water, could be added to these, I should certainly accept the substance possessing all these qualities sooner than any other.

Glycerine.

Liquid vaseline (Paraffinum liquidum).

Preservation of lubricants in vessels fully exposed to dirt.

Lubricants are generally preserved in open jars, tins, or bottles, with or without covers, but in any case dust has free access and infection must follow, unless the lubricant itself possesses antiseptic properties which, as I have already pointed out, invariably cause smarting in the urethra, besides being inefficacious in a strength suitable for use. Recently collapsible metal tubes with screw caps have been used, they are filled with the lubricant and boiled, and a small portion of the material is expressed as required. But of course the tube and contents

Collapsible metal tube.

require frequent boiling if sterility is to be maintained.

The method of lubrication now adopted must render sterile instrument septic.

The **application of the lubricant,** which is performed at the time of using the instrument, is most frequently made by dipping the sterilised catheter into the vessel containing it and letting the lubricant run over the surface by gravity, or, what is far worse, by smearing it about with the finger and thumb. Instruments must become infected by such a process, not only from the hands, but also from the exposure. Lubrication with a collapsible tube is rather safer, especially when its nozzle is adapted to receive the catheter as it is passed up and down to distribute the material. There is nevertheless a good deal of handling involved.

To sum up shortly, the present methods of sterilising both instrument and lubricant generally depend on the use of chemical antiseptics, which, if efficient, are without exception irritating. This defect can only be remedied in regard to the former by introducing tedious and risky expedients, *i.e.*, rinsing the instrument with inert fluids *supposed* to be sterile. The lubricant, either from the way it is kept, from the material used, or from the method of application, is almost invariably septic, and consequently must contaminate an instrument, even if the latter has been previously carefully sterilised.

The preparations previous to instrumentation frequently neglected.

The **preparation of the parts,** the hands, the penis, &c., which immediately precedes the introduction of an instrument, is far too frequently neglected, though it is obviously necessary if infection is to be avoided. The foreskin should always be withdrawn, and kept back, to cleanse the glans and orifice of the urethra. When this cannot be done, an operation, either circumcision, or division on the dorsum, must be performed, especially if the use of instruments is frequent. The question, for what distance the healthy urethra is normally invaded by living, though inactive, micro-organisms, has not been decided, but some surgeons recommend as a preliminary to instrumentation that the urethra should be thoroughly washed out by repeated injections. I think this precaution is unnecessary, firstly because it disturbs the passage considerably, and adds troublesome manipulation; secondly, because it is admitted that no amount of injecting can entirely remove the micro-organisms present; and thirdly, because clinical experience proves that no evil effect follows instrumentation, if properly carried out, when this step is omitted. Nevertheless, I do make use of the mechanical protection provided by nature against this invasion, *i.e.*, I always direct the patient to void a good supply of urine in a full stream, when he is able to do so, immediately before passing an instrument, which serves the same purpose. And, finally, more stress should be laid on the importance of not touching a sterile instrument, while introducing it, more than is absolutely requisite. One frequently sees a patient finger his catheter all over! His one object is to get it in somehow! He, in fact, "shuffles" it in, and is greatly relieved and often surprised to find by the welcome gush of urine, that it has entered the bladder. Such a "performance" usually indicates bad teaching, if he has been taught at all, which in many cases is very doubtful. The

Normal invasion of urethra by microbes.

The question of their removal by injections.

Employment of the natural flushing of the urethra.

Instruments not to be fingered more than essential.

habit of touching the instrument two, or at most three times, is a matter of practice, and can be acquired by a patient under ordinary circumstances by a regular system of drill.

Habit acquired by drill.

CHAPTER V.

INSTRUCTIONS FOR PASSING THE VARIOUS KINDS OF INSTRUMENTS.

Erect position.

General Hints.—Instrumentation is most readily performed while standing, the feet slightly separated, and the back resting, if possible, against some firm support. Instruments certainly pass with less difficulty in this position, and the bladder is rapidly and completely emptied if a catheter is being used. Moreover the downward pressure of the abdominal viscera prevents the possibility of air—a source of infection not to be neglected—being drawn from the outside into the instrument or organ itself. Some patients are obliged – either through faintness or the loss of power in the lower limbs—to lie down, though this renders the emptying of the bladder almost impossible, and the urine has to be expelled by pressing with the hand on the lower part of the abdomen, or some such expedient. It is now, when the weight of the intestines is removed by the position of the body, that the bladder is liable to dilate under atmospheric pressure and air to be drawn in. This accident may be prevented by attaching one end of a piece of soft indiarubber tubing to the external end of the catheter, the other extremity dipping into a vessel containing a sterile fluid.

Recumbent position.

Gentleness of manipulation.

Instruments should always be introduced with *extreme gentleness*, force is never required. A certain amount of pressure may be exercised to overcome the resistance of the muscular contraction of the passage itself, or a stricture, but nothing more. The movement should, as a rule, be continuous, slow and gliding, not short jerky rushes, and the instrument pressed home with total disregard to any obstruction which may be met with. The introduction is facilitated by *stretching the penis to its full extent,* and it should never be undertaken when there is a strong desire to pass water, urine should be voided if possible, or the desire allowed to pass away before proceeding. If the desire to pass water comes on *during* the introduction, the instrument should be at once withdrawn and a fresh start made when it ceases. Neither should any attempt be made during erection, which not infrequently exists if the bladder is full.

The movement in instrumentation.

How introduction facilitated.

When instrumentation forbidden.

The operator is often conscious during the passage of the instrument that its further progress is opposed. No good is attained by rolling the instrument between the finger and thumb, or withdrawing it an inch and then thrusting it in again with renewed vigour, as is so often done. Such manœuvres only stimulate muscular activity in this sensitive canal, and tend rather to increase the resistance. All that is necessary is *to exert a gentle steady pressure* for two or three seconds or even longer, then the obstruction will gradually yield and the instrument will again glide along quite easily.

Opposition offered to introduction.

To overcome the resistance.

A catheter should only *just enter* the bladder, its entrance is indicated by a flow of urine, and it can never be said to have been passed properly without this flow occurring. If the point is too far in, the

Distance to insert catheters.

Pain when the bladder is emptied.

patient often experiences a sharp twinge of pain at the moment the bladder is emptied, that is when the walls come in contact with it. Directly there is a free stream the catheter should not be moved, in fact, it is better to remove the hands and to allow it to take up a natural position; of course, when the natural desire to micturate is strong while the flow through the catheter continues, it must be held, otherwise it will be expelled by the muscular effort of the bladder. Sometimes the urine will not flow although the bladder has been reached. This is probably due to the blocking of the catheter itself with a small clot of blood or plug of mucus. A good cough, especially if the bladder is full, will often dislodge it, or recourse may be had to the indiarubber washing out bottle (p. 115), or the catheter removed and another one used in its place. Novices, I think, fail to draw the urine more from the fear of introducing the catheter too far than from any other cause. Soft instruments, if used reasonably, will certainly never do any serious harm. Again, the steady flow of urine is sometimes interrupted and the stream comes in little jerks, and the patient feels a peculiar thrill. This is produced by the walls of the bladder coming in contact with the instrument, and repeatedly, though momentarily, blocking the eye. Moving the catheter a little further in will, as a rule, obviate the trouble.

Blocking of catheter.

How to remove obstructions in the catheter.

Reason why novices fail to draw urine.

The fluttering bladder.

How to empty the bladder completely.

The bladder is not necessarily empty when the flow of urine ceases, but it is very important to see that it is so before withdrawing the catheter. The instrument is, therefore, first pushed very gently and slowly inwards half an inch and then withdrawn an inch. Directly any urine runs the movement is stopped and the water allowed to escape. In troublesome cases the process may have to be repeated two or three times, and in some the last drops are best withdrawn by twisting the catheter so that the eye takes up a fresh position in the bladder. A catheter when being withdrawn is charged with urine which will be sprinkled over the clothes or on the carpet, as it leaves the penis, if care is not taken. To avoid this disagreeable little accident the thumb should be placed firmly over the slanting end when the catheter is half way out. No urine can now escape until air is admitted, which can be done when the eye is over a convenient vessel.

To prevent the clothes being wetted when the catheter is withdrawn.

The thickest part of a bougie must entirely pass the stricture. With a soft tapering French instrument, an inch or more of the flexible internal end will generally enter the bladder, leaving an equal length outside the penis. The English bougie is shorter, as it does not taper much, and if inserted to within this distance of the external end will do its duty efficiently. When the conical metal dilator is used the handle must be well depressed between the legs, and the instrument felt to be hanging freely.

Distance to insert bougies.

DIRECTIONS FOR PASSING CATHETERS AND BOUGIES.

The instructions here given for the use of the various kinds of instruments have been framed with the idea of reducing the *amount of fingering* as much

Instruments not to be touched more than possible, and the reasons.

as possible. The less there is, the smaller the chance of infection. Metal instruments may be quite easily passed by holding them only by their external end. Soft instruments by shifting the position of the fingers two or three times, but indiarubber catheters by many such changes. An instrument, after it has been sterilised, should not touch nor be touched by anything except the forefinger and thumb. If by accident the clothes or surrounding objects should do so it must be discarded and a freshly prepared one selected.

Metal instruments touched once only.

Soft ones twice.

Indiarubber many times.

Nothing should touch instruments except the hand.

Correct way to hold penis for instrumentation.

Draw back the foreskin, hold the penis firmly between the first finger and thumb of the left hand so that it does not slip from the grasp. The thumb is the uppermost and should touch the organ on the middle line where the head of the penis joins the foreskin. The point of the first finger placed below should not be quite central, but rather to the side nearer the tip of the thumb, except when an indiarubber catheter is used. Nipping the urethra is thus avoided, though with the instrument mentioned, compression is required to prevent the instrument slipping out again. The remaining three fingers should be placed below, behind the first, to support the penis. A patient when he begins to learn to pass an instrument does not seem able to prevent the penis slipping through his fingers directly he attempts to stretch the organ. This complicates the introduction, as then the left hand interferes with the right as the instrument is pushed home, and the catheter or bougie is touched and probably contaminated. If the foreskin is first retracted and the left hand finger and thumb are applied to the exposed

Cause of organ slipping from the grasp.

portion of the organ, as directed above, this accident is much less likely to happen. The hand should never be removed from the organ during the operation under any pretext whatever.

DIRECTIONS FOR PASSING A METAL CATHETER.

Position of penis.

The way to hold the catheter.

The penis should be stretched to its full extent and held at an angle of 45° to the body. Take the catheter, lightly holding the shaft between the loops, with the tips of the forefinger and thumb of the right hand, and allow the middle finger to rest against the catheter lower down (fig. 28). This hand

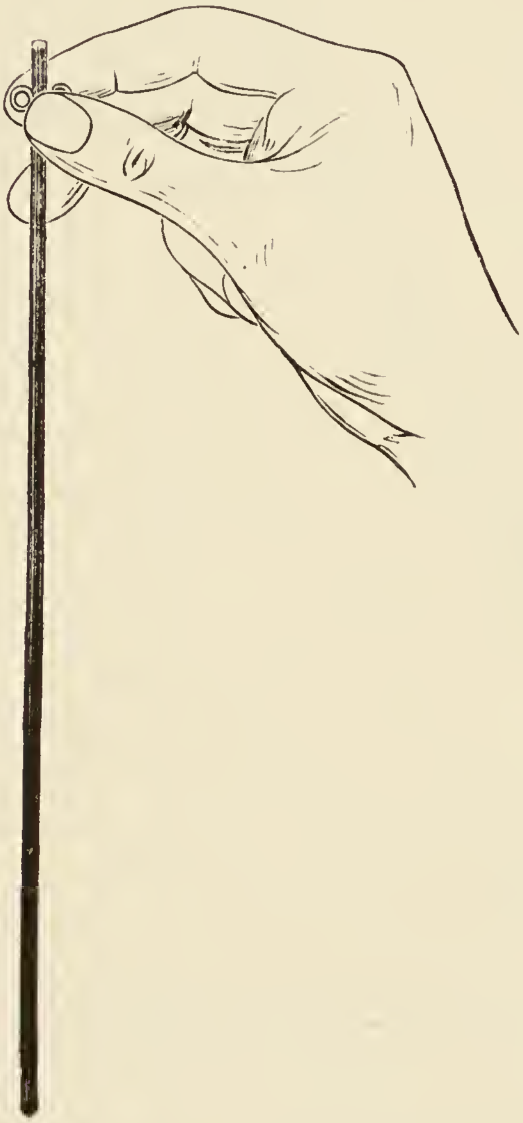


FIG. 28.—Patient holding metal catheter ready for passing (front view).

Position. is then brought against the chest in the mid-line, the point of the catheter being directed towards the patient, and while the main direction of the shaft is downwards it slopes gently forwards (fig. 29). The actual introduction may be divided into two stages.

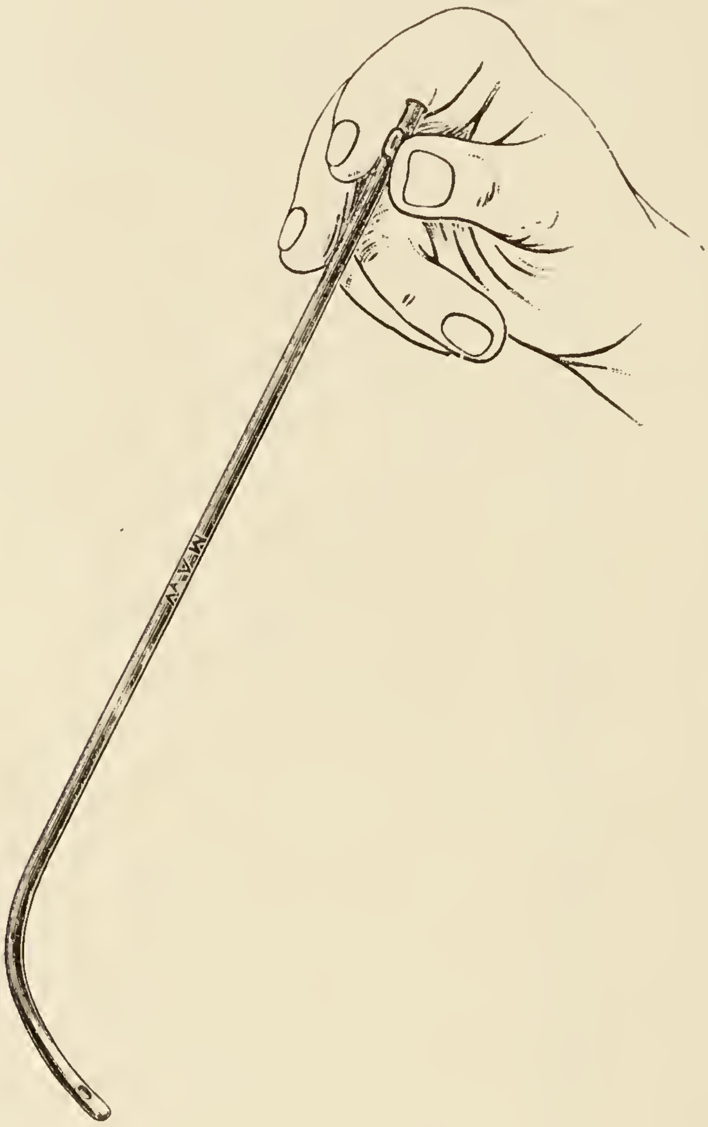
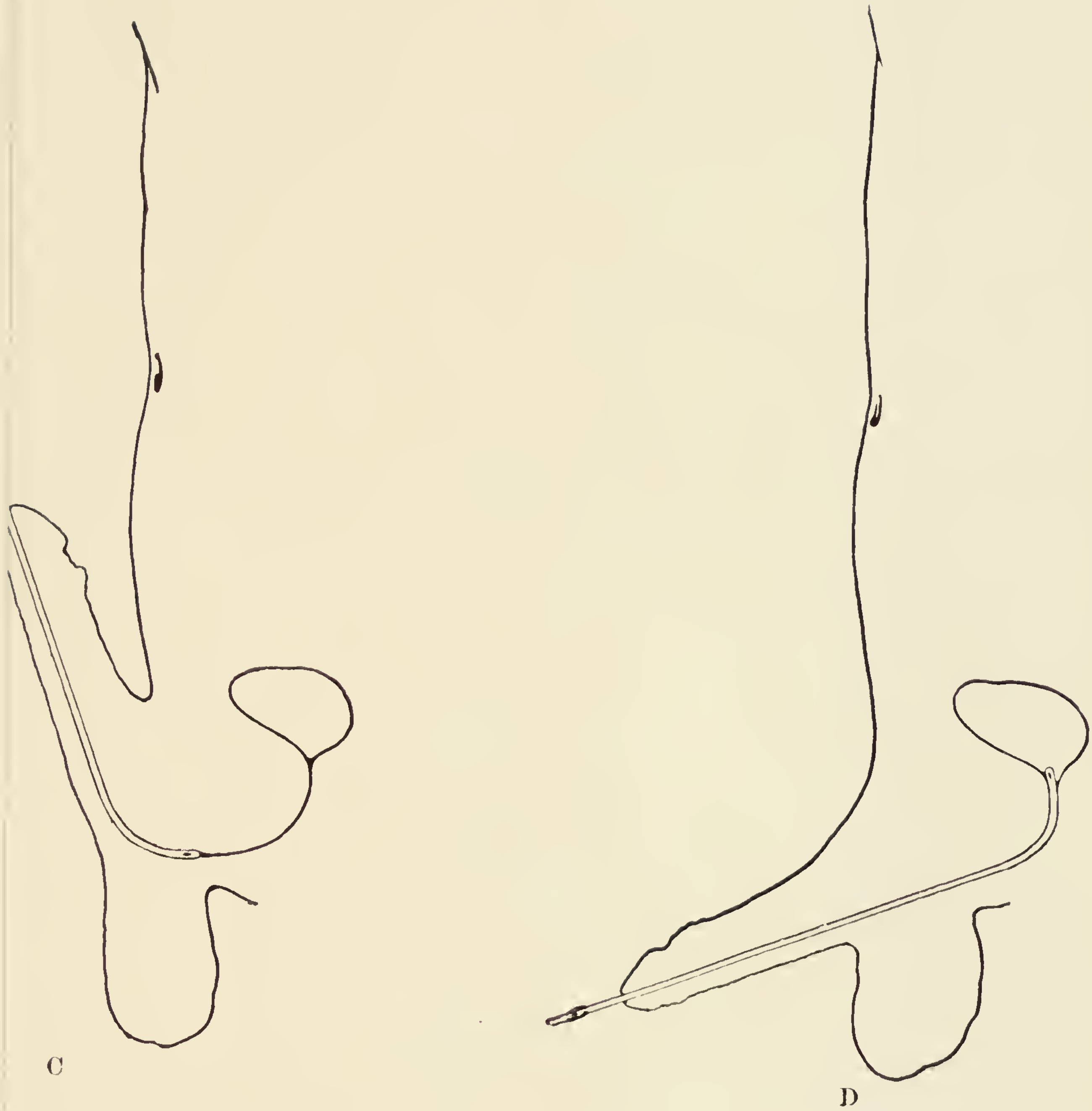


Fig. 29.—Patient holding metal catheter ready for passing (side view).

First stage. *First Stage.*—The point is inserted into the orifice of the urethra (fig. 30 A) and pressure is made with the middle finger without moving the hand, so that the curved part of the catheter traverses part of the *penile* (*pendulous*) *portion* of the urethra (fig. 30 B). When the curve is buried, the penis should be drawn



of a Metal Instrument.

ed. C, end of first stage, the dotted lines
e operation, D,

up with the left hand over the instrument so that both penis and the shaft become nearly vertical, and at the same time the catheter is pressed downwards by the right hand. Under this pressure the shaft will sink down some four inches (fig. 30 C), and care should be taken to allow it to go as far as it will before commencing:—

Second stage.

The Second Stage.—The right hand, which has till now been near the body, though naturally rather lower down than at the commencement, is separated from the abdomen by a circular movement, so that the external end of the catheter is brought gradually and slowly downwards—noting that it glides inwards and onwards the whole time—until it points towards the ground (fig. 30 D). The left hand follows a somewhat similar course, it passes through the arc of a smaller circle. The urine may flow at any time after the horizontal is passed and the operator should be prepared to stop the moment it does so. The exact time depends entirely on the length and condition of the urethra and must be learned by experience.

The point at which the catheter enters the bladder.

Failure, its cause.

Failure in passing a metal catheter is generally caused by the first stage being improperly carried out; either the right hand has not been kept near enough to the body or the shaft has not been allowed to sink well down perpendicularly, or perhaps both points have been neglected. When this is the case one is conscious during the circular movement of the second stage, that the instrument is not passing, *it is not gliding along*, and appears to be hooked up, as it really is. After waiting a few seconds the catheter should be returned, quite slowly,

Remedy.

to the position it held at the beginning of the first stage, but with the right hand well against the abdomen. The penis should *again be pulled up* and very gentle downward pressure exerted with the right hand. Very probably, with this manipulation, the shaft will sink down another half inch—all that is required—and the second stage may at once be proceeded with, the catheter passing satisfactorily and easily into the bladder. After use the catheter is withdrawn by simply reversing the movements just described, the external opening being closed with the thumb (p. 55). It is rarely necessary to hold the penis, though in exceptional cases the act is assisted by pushing the penis back along the shaft while the upward circular movement is made.

To withdraw the metal catheter.

DIRECTIONS FOR PASSING AN ENGLISH GUM ELASTIC CATHETER.

Passing English catheters. Directions same as for metal.

The same instructions are required for this form of catheter as for the last, especially if a similar curve is maintained by a wire stylet. As, however, the latter is frequently removed the instrument assumes a wider sweep (curve), in which case the right hand need not be kept so near to the body to begin with. Perhaps, too, slightly more pressure is necessary throughout. If a stylet is used it is generally withdrawn when the urine flows. Sometimes also it is a good plan, when there is some special peculiarity of the canal, to draw the stylet out a couple of inches in the middle of the second

Removal of stylet.

Special manœuvre to overcome obstructions.

stage. This gives the point of the catheter a tilt up and enables it to ride over an obstruction on the floor of the urethra.

DIRECTIONS FOR PASSING A COUDÉE CATHETER.

Passing coudée catheters.

Position of penis.

The way to hold the catheter and position for passing.

The penis should be held straight up and fully extended. The catheter should be held at 4½ inches from the point between the tips of the first finger and thumb of the right hand, the rest of the fingers being doubled up. The slanting "cut" *should face the patient* when the catheter is held perpendicularly in front and the point will therefore be directed towards him (fig. 31). The introduction is divided into three parts.

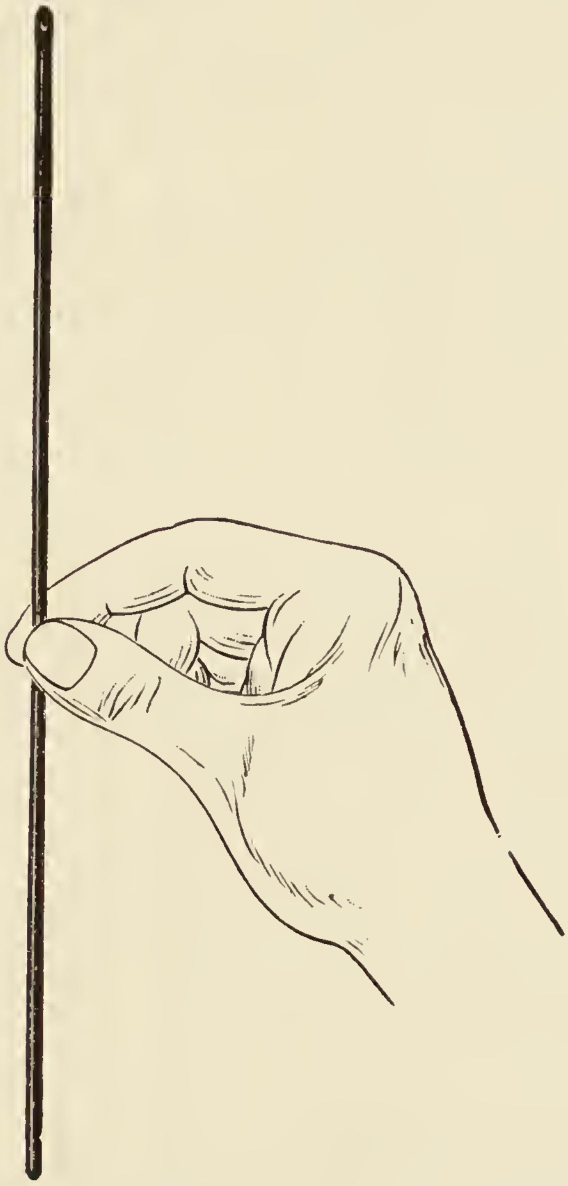


FIG. 31.—Patient holding a coudée catheter ready for passing (front view).

First stage.—Insert the point of the catheter (fig. 32 A) and push it down until the finger and thumb touch the top of the penis (fig. 32 B).

Second stage.—Leave go the catheter, and take up a fresh position 2½ inches from the first, holding it in the same manner. Push it gently onwards, but *at the same time lower both hands* (the one holding the catheter, the other the penis). These two movements must be simultaneous and so arranged that the right hand touches the tip of the penis when the catheter becomes horizontal, which finishes the second stage (fig. 32 C).

Third stage.—Again move the right hand 2½ inches along the shaft and continue exactly the same movement. Directly the urine runs, *stop*, and do not attempt to push the catheter any further in (fig. 32 D).

Buckling and bending of catheter.

Although the catheter is supple it must not be bent or buckled at any time during the operation—it should always be kept perfectly straight.

The cause

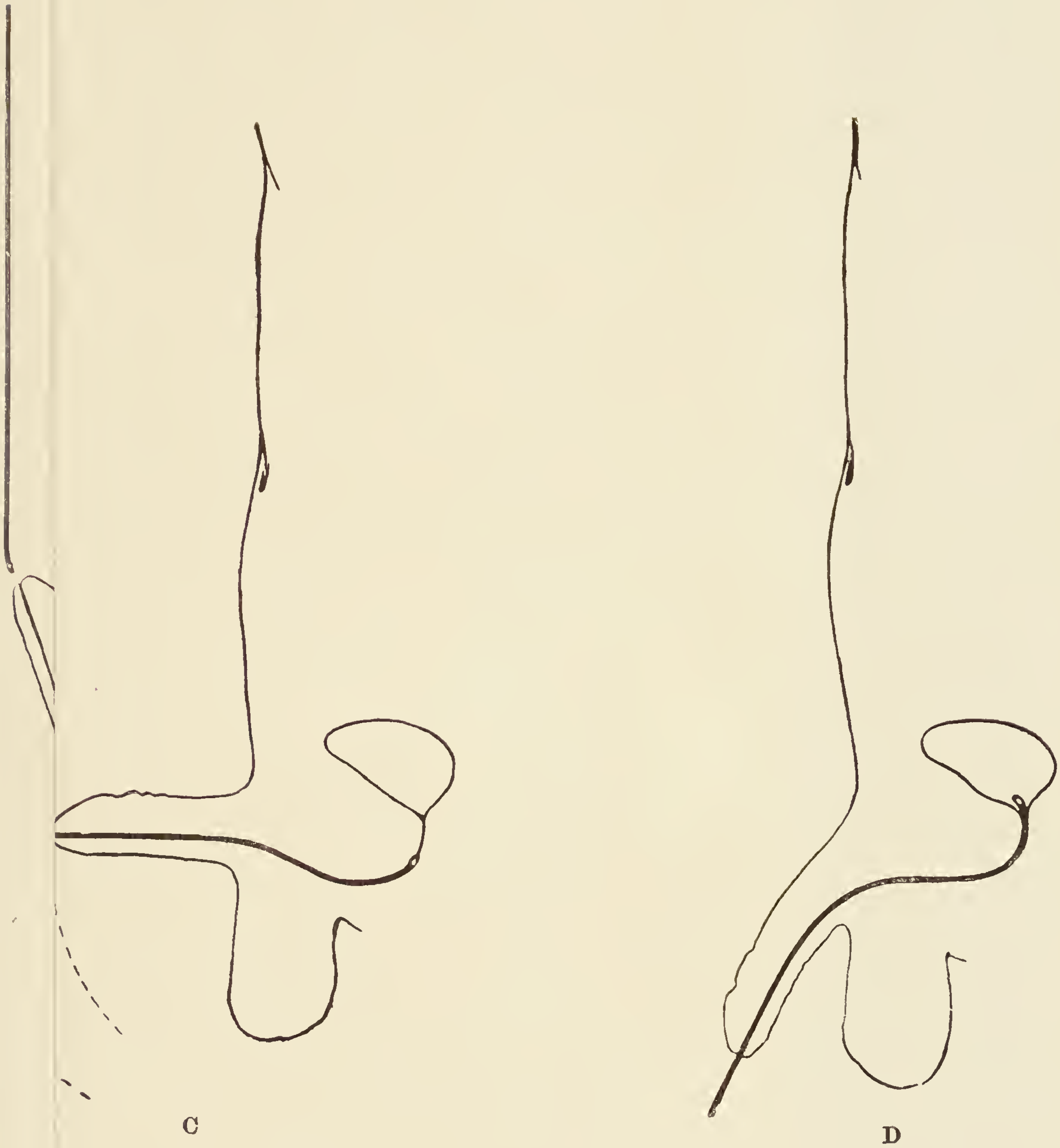
Buckling occurs generally through the two hands not moving together: either the right moves too much in advance of the left during the second and third stages or *vice versa*, or the hands are not kept in the middle line, or finally the operator endeavours to introduce the instrument too rapidly before the muscular passage in front of the point of the catheter has time to relax.

Caution about shifting the position.

In shifting the position for the three stages the fingers should be entirely removed from the catheter—not slipped along the surface—and the new situation taken *without touching the intermediate part.*

How to remove catheter.

The catheter will not fall out when left to itself at the end of the first stage



C

D

a Coudée Catheter.

lines indicate the direction taken by the
nd of the third stage.

if the change is made moderately quickly, but it may bend on itself and require to be brought into the straight before continuing The catheter is removed by simply reversing the action used to introduce it, the external opening having been blocked completely with the thumb, though the penis need not be held. If the eye has been twisted for the purpose of emptying the bladder (p. 55), it must be brought back to its original position before withdrawing.

DIRECTIONS FOR PASSING OLIVARY AND CYLINDRICAL CATHETERS.

The directions are the same as for the Coudée catheter.

DIRECTIONS FOR PASSING AN INDIARUBBER CATHETER.

Position of the penis.

The way to hold the catheter, and to introduce it.

The penis is held nearly horizontally (p. 56). The catheter is taken between the first finger and thumb of the right hand *two and a half inches from the point,* this is quickly pushed into the urethra. The forefinger and thumb of the left hand then gently compress the canal, and *also the catheter* to prevent it slipping, while the right hand is moved *an inch* along the shaft. The pressure is relaxed and this part is inserted, and so on until the bladder is reached. These short lengths are necessary on account of the extreme flexibility of the instrument, A quick movement necessary.

and are introduced by a quick movement applied in the direction of the penis. The pressure of the right hand introducing the catheter must not be removed directly the fingers touch the penis, but should be continued for a few seconds to allow it (the pressure) to travel along the compressible shaft to the point. If this precaution is not taken the catheter will spring back again as soon as the right hand is taken away. The rebound or outward spring of the catheter is especially noticeable on approaching the entrance to the bladder where the resistance is increased.

Pressure on catheter well maintained, otherwise catheter rebounds.

Advantages outweighed by disadvantages.

The indiarubber catheter is in many respects the easiest of all instruments to pass; it requires very little skill when it is new and the urethra quite natural. On the other hand it very rapidly deteriorates, swells—often increasing two or three sizes—loses its polish, and appears to cling to the canal when passed. It is then of course totally unfit for use, and is also liable to break. The great objection, however, is the large amount of fingering required in its introduction, which, as we have already seen, adds so largely to the chance of infecting the bladder and urine with micro-organisms. If for some reason its use is imperative, particular attention to the cleansing and preparation of the right hand is required, before commencing the operation.

THE WAY TO PASS A CONICAL STEEL DILATOR.

The instructions given, relative to the introduction of a metal catheter, apply to this instrument, though

The way to hold the dilator.

they vary in some minor details. The bougie is held in the same way, but by the flat handle. The extra weight of the solid instrument materially assists in its introduction. Thus, very little pressure is required at all, the hand only acting as a guide, and preventing the bougie from turning out of its proper course. The great secret is to keep the *penis fully stretched and well up* in the middle of the first stage, and not to begin to lower the left hand too soon.

Little or no pressure required.

The English bougie.

The introduction of the **English bougie** is accomplished by the same movement as for the English catheter (p. 60).

The soft **French taper bougie** is passed in the same manner as the Coudée catheter.

The method of using **syringes** for making injections into the bladder and urethra, is described on pp. 115 and 154.

CHAPTER VI.

RETENTION OF URINE IN THE BLADDER AND THE SYMPTOMS IT PRODUCES.

A SHORT account of the various diseases—**retention of urine** in the bladder, **stricture** of the urethra, and **urethritis**—which necessitate the use of instruments is now given, for I am sure a patient is much more likely to carry out carefully any suggestions made if he understands the reason for doing so. I, therefore, usually indicate the symptoms which may arise, and the corresponding treatment, as far as it relates to simple remedies.

The cause of residual urine

Every healthy person empties the bladder completely when he passes water. This, however, is not invariably the case in urinary complaints, and many patients, either through the loss of the muscular expulsive power, or through some mechanical obstruction to the outflow fail to do so satisfactorily, and urine is left behind in the bladder after they have passed all they can by their own efforts. Of course they are totally unconscious of the fact, and will, if questioned, at once say that they are quite sure they have emptied their bladder from their feelings, and also because the quantity of water passed in twenty-four hours is natural. Feelings are very frequently, as in this case, unreliable, and the second reason offered, although a correct statement, is no argument against the possibility of the defect. The bladder may be distended by fluid unable to escape, which practically obliterates its functions as a reservoir, and yet the kidneys continue to make the ordinary amount of urine, which runs away as fast as it is secreted. The question can only be definitely settled by introducing a catheter immediately after the urine has been passed by the natural efforts, and by measuring the quantity drawn off.

Question of residual urine determined.

The constant presence of this "**residual urine**" as it is termed, gives rise to a variety of symptoms, their severity depending on the amount retained. In the early stages of the trouble the quantity may not exceed a few teaspoonfuls, and the symptoms are then only a slight difficulty or hesitancy in commencing to micturate, more especially on rising in the morning. The size and force of the stream itself is little altered when once it has commenced to flow, though it *decreases in strength* towards the end of the act and may even fall at the feet. Perhaps, too, the patient may have to pass a comparatively small quantity of water once or twice while dressing, the larger quantity being voided at the second attempt, or even to rise once during the night. At any rate the symptoms are trifling, and, from the insidious way they come on, may well pass unnoticed. As the complaint advances, and more "residual urine" collects, the difficulty in passing an ordinary amount of water is accentuated, and the patient is awakened many times during the night—perhaps every half hour—with an urgent desire to micturate. The call is often accompanied by straining and pain, only a small quantity of urine being discharged on each occasion. The stream has now quite lost its force,

Symptoms of commencing retention of urine.

Residual urine appreciable, symptoms increase.

and the urine only feebly *trickles away* from the penis, or is at best thrown out with *much muscular effort* in little jets. In very pronounced cases--when the residual urine may be measured by pints and not by ounces—involuntary discharge of urine not uncommonly takes place during sleep, in fact the urine runs away as soon as it is secreted and is not retained in the bladder at all. There is nothing particular to remark about the urine itself, for when freshly passed it is quite clear and devoid of offensive smell. The symptoms then of inability to empty the bladder are *increased frequency of micturition, more marked at night, at first hardly noticeable, but gradually increasing in severity if neglected.*

When pronounced, symptoms distressing.

The urine is natural.

CHAPTER VII.

TREATMENT WHEN THE QUANTITY OF RETAINED URINE IS SMALL.

The treatment to prevent increase of residual urine

SURGICAL interference in the form of instrumentation is not necessary for patients who have slight symptoms. The entire treatment should be to arrest, as far as possible, the accumulation of water in the bladder. Much may be done in this direction by paying attention to the way the urine is passed.

Expulsion of urine assisted by freeing the clothes.

By allowing ample time.

The *clothes should always be very freely undone* so that all pressure is removed from the organs, especially the penis. The patient should never be in a hurry, but allow the dribbling stream, which frequently occurs towards the end, *ample time to finish* completely before dressing. Strain or urging the flow is useless, and only hinders the expulsion in the end, if it does not do actual harm. All the muscles must be relaxed and the urine simply allowed to trickle away by the force of gravity. Sometimes it is advisable also to repeat the attempt a few minutes later, after walking about a little, when probably another ounce or so will be voided.

By second attempt to micturate.

Bladder never allowed to become over distended.

The bladder should *never be allowed to become full or over distend*. It is, therefore, better to urinate rather too frequently than too rarely. Thus a patient who has drunk freely—especially of fluids like tea and champagne which stimulate the activity of the kidneys—should be careful to pass water as soon as he feels the slightest desire, and certainly not postpone the act one minute longer than he is compelled.

External influences assisting micturition.

Many *external influences* assist in calling the muscles of the urinary organs into play; thus the sound of running water, the application of cold to various parts of the body, dipping the fingers in cold water, or even the pulling of the penis, and more rarely, pressure on the lower part of the abdomen may be tried in cases when there is difficulty in commencing micturition.

Best position of body.

The bladder is most nearly emptied after stool, and many adopt this *position to pass water,* raising the feet slightly and bending the body forwards, so that the thighs are brought well against the abdomen. Failing this, micturition is assisted by bending the body while standing with the feet apart, and resting the head against some firm support. Another position which some patients find useful, is to kneel up in bed and bring the head forward on to the pillow, while the vessel is held beneath.

Attention to general health.

The *general health* must be attended to. Anything which improves the general tone of the body will react upon these special organs, and above all, great care should be taken to regulate the bowels, so that they are moved once daily (p. 88).

Administration of drugs and electricity.

The question of the administration of drugs, and the application of electricity, must be left entirely to the medical man, and only carried out under his supervision. It is as well also to ascertain occasionally *what progress the trouble is making,* that is, what is the amount of "residual urine"? This information, of course, can *only* be obtained by the

Progress of the trouble ascertained only by catheterisation.

introduction of a catheter immediately after passing water, and measuring the quantity drawn off. If the amount is less, or remains the same as it was three or four months before, well and good, but if it has increased to four or five ounces, the propriety of passing the catheter, perhaps once a day, must be considered. For it is better, and less likely to lead to bad after effects, to commence the use of the catheter comparatively early, than to wait until a large amount of residual urine collects before doing so. In any case the patient should at once be taught to pass the instrument for himself, and so be prepared for any emergency which may arise.

CHAPTER VIII.

Local Treatment when the Quantity of Urine is Large.

The number of times the catheter has to be used in the twenty-four hours determined.

We must now turn to the treatment of those who are compelled to use the catheter, having learned the art under the surgeon's eye, and who are now left to their own resources. The first question which will arise is, *how often is the catheter to be used in the twenty-four hours?* It is a most important one to settle. No one will willingly undertake such an operation more frequently than is absolutely necessary, though it is clear that a mere matter of convenience must be entirely subservient to the demands for the best treatment of the impaired organ.

Explanation.

The answer depends *mainly*, for there are subsidiary ones, on two factors; firstly, on the **quantity of residual urine,** and secondly, the **capacity of the bladder,** *i.e.*, on the total amount of urine the bladder of a particular patient can hold, without producing the desire to micturate.

The number of times is in no way governed, as patients so generally suppose, by the total quantity of urine eliminated in the twenty-four hours. For, as we have already seen (p. 66), he may void an average amount, passing it frequently and in small quantities, and yet have many ounces of water left behind. In health we are conscious of the bladder being full by the desire to make water. Should this occur more frequently than natural, and be relieved by passing a small quantity, we may conclude that the capacity of the bladder has been diminished.

The conclusion in these cases is of course correct, for a considerable portion of the bladder is already *habitually occupied* by the residual urine, leaving only a small space in which any additional fluid may collect. Suppose now the residual urine is syphoned off by means of a catheter, the entire capacity of the bladder is at once restored, and no desire to urinate occurs until the bladder is full, which will be, when the kidneys have secreted an amount equal to the residual urine plus the small quantity previously required to fill the organ. The patient then expels the quantity usually passed, and unless the catheter is employed again, returns to his habit of passing small quantities at frequent intervals.

Example.

To illustrate my meaning more clearly, say the total capacity of a certain patient's bladder is fifteen ounces, and that he is known, by investigation, to have nine ounces of residual urine. The addition of six more will completely fill it, and arouse the desire. Now roughly the average rate at which the urine is passed from the kidneys into the bladder is three ounces an hour by day, and one and a half by night. Consequently this patient is called upon to micturate every two hours in the day, and every four hours at night. If the residual urine was twelve ounces, the call will be every hour; and if fifteen, completely filling the bladder, the patient voids urine a few drops every minute or so, with straining, or it runs away involuntarily.

If a catheter is employed by a patient with nine ounces of residual urine, and the bladder emptied by it on rising at eight o'clock in the morning, no call to micturate will occur until one (five hours after, *i.e.*, the time taken to secrete the fifteen ounces of urine required to fill the bladder), six ounces being then passed naturally. Two hours later, at three, there will be another call, when the bladder should be cleared by the instrument. This will carry the patient on through the next five hours to eight o'clock, when he voids naturally six more ounces. At ten, on retiring to bed, he will introduce the catheter for the third time, and the night will be passed undisturbed.

Rule for the use of the catheter.

Thus, by using the catheter three times during the day, the number of micturitions in the twenty-four hours has been reduced from ten or eleven, of which at least three have been at night, to five times with no disturbance during the sleeping hours. Again, the patient with twelve ounces of residual urine will get relief if he introduces the catheter some seven times in the *forty-eight hours*, rising rather earlier, and retiring rather later on alternate days. And lastly, four times in the twenty-four hours will suffice to keep the patient, whose bladder is filled by the residual urine, quite comfortable. *The indication, therefore, for the use of the catheter is the recurrence of the unnaturally frequent desire to micturate; and the number of times it has to be employed depends on how often these abnormal calls arise.*

Change of hour and frequency of catheterisation arise from alterations in the bladder capacity.

No patient of course can be treated for any length of time, nor from day to day, with this automatic and mathematical precision. Alterations occur in *the capacity of the bladder,* thus in course of time the organ may either become permanently distended and enlarged by the constant pressure of the "residual urine," the patient then holding his water, without any desire, longer than he has ever done before in his life, or it may be diminished in size by the growth or thickening of neighbouring parts, rendering the more frequent use of the catheter necessary.

From the variations in the amount and rate of the secretion of urine.

The change of the hour and frequency of catheterisation on subsequent days, which of course is independent of any alteration in the bladder itself, is required by the *variations in the amount and rate at which the urine is eliminated by the kidneys.* For although the average total amount in twenty-four hours is fifty ounces, secreted at the rate of three ounces an hour by day, and one and a half by night, yet they both vary considerably under different conditions. The total amount may be as low as twenty or as high as seventy ounces a day, produced at the rate of from less than one to more than six ounces an hour. The latter (the rate) changing constantly, during the morning it may be four and a half, and in the afternoon one and a half ounces an hour.

Fixed hour for catheterisation impossible.

These fluctuations depend on the *quantity of fluid taken,* and on the activity of other organs (the skin, the lungs, and the bowels) concerned in throwing the liquids off from the body, as well as on mental excitement. It is impossible, therefore, although the Chapter on General Treatment (p. 79) deals with the question of regulating the secretion, to fix the precise hour for catheterisation, just as it is impossible to say that a healthy man is to urinate at the same time every day.

Times most suited.

We may nevertheless mention certain times as likely to afford the catheter patient most relief under ordinary circumstances. One more or less fixed hour will be *immediately before retiring to bed,* for all are anxious to secure as much undisturbed sleep as possible, and to avoid being awakened by a tiresome and urgent desire to micturate. The catheter patient who has the normal bladder capacity will be no more troubled after its use, than the individual who possesses the natural expulsive power, and who sleeps the night through in comfort.

Last thing at night.

First thing in the morning.

On rising in the morning the bladder is distended, and moreover the muscular power, on which the expulsion of the urine depends, does not acquire its full force for some time after the patient is awake. Consequently difficulty in commencing the act, and frequent attempts with small results are experienced. It is now, when these disagreeable symptoms are most marked, that a second introduction is required.

During the day.

During the sixteen hours of the working day the catheter should be used *when the unnaturally frequent desire to micturate occurs*—or rather before, if the hour has already been ascertained by experience—though the intervals throughout the day may not be equal. It should always be employed immediately *before any important and lengthy engagement* is entered upon. Otherwise the fear that an irresistible desire may overtake him, when there is no opportunity of satisfying it without much disturbance, is often a source of great anxiety, materially aggravating his condition (p. 90). If he knows he has an empty bladder he feels safe, and does not worry.

Before entering upon any serious occupation.

Question of micturition before catheterisation.

We now come to the question of whether it is *advisable to try to micturate immediately before catheterisation.* In cases where urine is expelled without difficulty no doubt it is beneficial, for its keeps the muscular mechanism exercised and flushes the passage. On the other hand, struggling and straining to void a few drops, causing, as it often does, aching pain across the belly and along the passage, is useless and even harmful. It is asking the bladder to perform an impossibility, to expel a fluid which cannot escape, thereby exhausting the already weakened muscles in a fruitless endeavour, instead, the catheter should be used at once *while there is no desire* and the organ relieved of its load and its remaining strength economised. We may say: *Micturition, if it produces pain, should not be attempted before catheterisation.*

Pain and straining caused by over-distension of the bladder.

All catheter patients are subject to similar pains if the bladder is allowed to become over-full, which may be caused either by a too long delay in emptying the bladder, or by the unusually rapid, and therefore quite unexpected, production of a large volume of urine. A total loss of all expulsive power through overstretching results in both cases, and the patient who is in the habit of naturally voiding some urine, cannot do so, any more than he who is entirely dependent on the catheter.

Example.

A good example of the sudden over-filling of the bladder is seen in the patient who dines out in thin evening dress, drinks freely of champagne, and returns home chilled by the night air. Although he may have recently passed some water he soon experiences considerable discomfort, with intense desire to micturate, and is surprised to find he is unable to pass any. The more he strains the worse the pain in the abdomen becomes and the more frequently do the calls to pass water occur, although his troubles will be immediately relieved by withdrawing the urine by means of a catheter, passed at a moment when he is free from the desire to urinate. *Straining, therefore, associated with pain in the region of the bladder occurring before the time of habitual catheterisation, indicate that the bladder is overfull, and requires immediate relief by the catheter.*

Relieved by catheterisation.

Too infrequent use of the catheter.

Patients who unwisely reduce the number of times of instrumentation beyond a proper limit constantly suffer from these symptoms. They should certainly be avoided by its rather more frequent use, for in addition to the pain, the distension weakens the bladder and renders the introduction more difficult. So, too, the patient who exposes himself to the conditions liable to cause a copious and rapid flow of urine, must be prepared to draw off the urine *on the first warning*, although it may be before the regular time.

Summary.

From the foregoing we clearly see that most of the troubles of a catheter patient are caused, provided he is and always has been surgically clean, by the *too infrequent use* of the catheter. Its free and proper employment will do much to retard a threatened total loss of power and is in many cases the agent best suited to restore even that which has been lost. In the words of Sir Henry Thompson, the patient should regard the catheter as his best friend and not as an enemy.

CHAPTER IX.

The General Treatment of a Patient compelled to Use a Catheter.

The object of the general treatment is :—

I. **To reduce the number of times the catheter is used in the day and to avoid its use at night;** that is by diminishing the total quantity of urine, and by preventing an unusual secretion during the hours of rest.

II. Though not of such importance, **to keep the hours of catheterisation at regular intervals;** accomplished by regulating the rate of secretion, and

III. **To prevent the occurrence of any condition which will reduce the capacity of the bladder.**

I. & II.—The amount and rate of the secretion of urine are so closely connected that they are conveniently dealt with together. They depend, as has already been stated on :—

a. The fluid intake.
b. The amount of fluid thrown off by the skin.
c. The amount of fluid thrown off by the lungs.
d. The amount of fluid thrown off by the bowels.
e. The nervous excitement.

The minimum amount of urine is passed when the intake of fluid is the smallest the demands of nature will allow, and the output by the other organs is the largest possible, nervous influence being disregarded. The variation between this extreme and the other, when a large quantity is drunk, the bulk being passed as urine, is unlimited, and advice must be given patients regarding habits bearing on each of these factors in order that as good a result as is compatible with health and comfort may be attained.

The quantity.

a. **The fluid intake.**—The quantity of fluid drunk must ultimately influence the amount of urine passed, though the result may not be at once apparent, the fluid being stored away in the tissues for some considerable time. Thus, much may be drunk on one day but not passed until the following, on which perhaps less fluid than usual has been taken. The average daily consumption—in addition to that contained in the food, which is composed of fully half its weight of water—is stated to be two and a half pints. Yet this amount is, to a large extent, a matter of habit, for many persons can and do live in perfect health on a much smaller quantity. I therefore advise catheter patients—although I do not wish thirst to cause inconvenience—to aim at a lower standard, and to accustom themselves to *habitually drink less.*

The character of liquid taken.

The *kind of fluid* must be taken into consideration. Everyone knows that certain drinks produce a flow of urine quite out of proportion to their own volume, as a general rule alcohol (spirits, wines, beers) does so, more especially if it contains stimulating principles, as there are in gin, a panacea with the uninitiated for all urinary troubles. Effervescing

Drinks to be avoided.

wines, champagne, &c., also possess this characteristic, and among the non-alcoholic drinks may be mentioned strong tea, though its action as with a large number of other liquids, is peculiar rather to certain individuals. Fluids proved by experience to provoke excessive secretion should be avoided, unless indeed the patient is prepared to use the catheter more frequently. It may not be wise at once to abstain from wines altogether, yet the amount should be materially decreased. The primary object of fluids —milk, thick cocoas, &c., are not included, for they are in reality strong foods in liquid form—is to dissolve and prepare the food for assimilation, and the best solvent of all is undoubtedly pure water. Alcohol, which may for other reasons become a necessary article of diet after constant use, is not a good solvent, and is, at any rate to begin with, taken only because people like it and not because the system requires it.

The object of taking fluid.

The tempera-ture. Hot and cold fluids.

The *temperature of the fluid* taken is important. Hot fluids pass through the stomach into the intestine unhindered, and are at once absorbed into the blood, the process of elimination by the kidneys following almost immediately. On the other hand, iced and cold drinks are detained in the stomach, until they are warmed, and consequently their excretion as urine is indefinitely postponed. The bearing of this rule is illustrated by the patient who occasionally takes iced drinks at dinner or in the evening. Instead, then, of passing off the intake in the form of urine on retiring for the night, as he usually does under ordinary circumstances, the process is delayed and the excretion does not occur until *after he is in bed,* then necessitating a rise to micturate. The temperature of the fluids taken should, therefore, be at least as warm as the body, if not warmer (99° to 130° F.).

The temperature at which fluids should be taken.

The time for taking fluid.

And finally, the most *appropriate time* for taking the quantity, as well as the kind of fluid allowed, must be selected. The larger portion should be distributed over the morning and early afternoon, to give ample time for its excretion before the hours of rest. Large draughts, as well as the habit of drinking between meals, should be avoided. It is advisable to drink after the meal is finished, not to eat a few mouthfuls and assist the swallowing of large pieces with a sip or two of fluid, an error both from a dietetic point of view and also because it encourages the consumption of a larger quantity of liquid. Liquids known to produce activity of the kidneys, if required, should certainly be taken in the early part of the day and not just before going to bed. In some cases peculiarities of action are noticed with the same fluid at different hours of the day. Tea at breakfast, for instance, may produce no effect, but in the afternoon does so almost immediately. These are, however, personal idiosycrasies and can only be learned by experiment and trial.

Diuretic fluids, and peculiarities of certain others.

The following sketch of the daily regime, for those to whom alcohol is essential, indicates what I have endeavoured to convey, although it cannot, and is not intended to be adhered to under all circumstances.

Morning Tea, 7.30 to 8 a.m. A quarter of a pint of weak tea or warm fluid, if desired, Temp. 100° to

130° F.; or this amount may be added to that taken at breakfast .	5 ounces.
Catheter, 8 to 8.30.	
Breakfast, 8.30 to 9.30 a.m. Half a pint of weak tea or coffee, 100° to 130°, with or without milk and sugar. The former should generally be small in quantity. . .	10 ounces.
Catheter 1 to 1.30.	
Lunch, 1 to 2 p.m. Half a pint of either plain water, effervescing water alone, or mixed with lime or lemon juice; a light claret, or better, a still Moselle, or when it agrees an equal quantity of weak whisky or brandy and water .	10 ounces.
Afternoon Tea, 4.30 to 5 p.m. A small cup of tea.	4 ounces.
Catheter 7 to 7.30.	
Dinner, 7 to 8 p.m. Half a pint *or less* of the same fluids as for lunch (*alcoholic drinks excepted*) which should never be iced . . .	10 ounces.
Catheter 10.30 to 11.30.	
Total . .	39 ounces.

The skin, important organ of excretion.

b. **The amount of fluid thrown off by the skin.**—The skin is not only the natural covering, but also an important organ which excretes—much as the kidneys do—the fluid and waste matters of the body. The more active it is the smaller will be the amount of urine passed, and *vice versa.* In advancing years—at the time when urinary troubles,

In advancing years becomes inactive.

and especially the one we are considering, are most common—it often loses its functions, to a large extent, through the want of proper care. Roughness and dryness take the place of the characteristic supple and silky feeling and rubbing hardly causes a blush. Our first care, therefore, is to restore its function and then to keep it healthy, removing the products of its activity as they are formed, by a systematic course of bathing, rubbing, and airing.

Endeavours to restore and keep in health.

The warm bath.

A *bath* of 98° to 100° F. should be taken every morning, or, if preferred, when dressing for dinner, in a warm room, ample time being allowed afterwards to dry every part with a rough towel. The whole body should be well lathered every other day before entering the bath, with a non irritating super-fatted soap, which must then be removed by a liberal application of water. As a substitute for this form of bathing a towel may be rung out in hot water and briskly rubbed over the body. The Turkish bath may be occasionally taken with good effect by those accustomed to it, or after medical advice, but I do not recommend a trial unless its action is known by previous experience. Finally, the foot-bath before retiring, at a temperature of 100° to 110° F., must be mentioned as sometimes useful to relieve frequent calls to micturate, apparently by decreasing the congestion in the region of the bladder (p. 91).

The towel bath.

The Turkish bath.

The foot bath

Changing the clothing.

All the *clothes should be changed* daily when dressing for dinner, two complete sets of underwear being kept in use for the purpose. The first is worn throughout the day and the second during the evening while the others are hung up to dry. A

Especially desirable after perspiration.

change, too, should be made *whenever the vest, &c., are wetted* with perspiration, caused perhaps by rather exceptional exercise during hot weather. Allowing them to remain on the body and to produce the chilly feeling which invariably accompanies the drying is always harmful and should be avoided, as the products thrown off in the sweat soon react upon the skin.

The air bath.

Rubbing the skin.

Before putting on the clean clothes the body should be *exposed to the air* for some minutes—no one will catch cold in a warm room by the short delay—and the skin then rubbed all over with a Cash's tape towel or flesh brushes systematically applied, gently to begin with, but more vigorously as the parts become inured, until the skin assumes a pleasurable feeling of warmth.

Exercise.

Men of sedentary habits derive considerable benefit from the daily use of such appliances (light clubs, dumb-bells, &c.) as call the muscles of the arms, legs, and trunk into play, thereby increasing the strength and reducing the superfluous fat which readily accumulates over the lower part of the body, though, of course, greater benefit is derived by taking exercise in the open air and sunlight. All forms of *exercise* should, however, be sufficient to accelerate the circulation and to produce some action of the skin as indicated by slight perspiration.

Surrounding temperature affects activity of skin.

The effect of the *surrounding temperature* on the skin is very marked. When it is warm and dry, most of the fluids of the body disappear invisibly as insensible perspiration, and little urine is produced, but when the atmosphere is cold and charged with moisture, the sudorific action is checked and the

Rapid changes.

volume of urine is correspondingly increased. Rapid variations of temperature produce a similar effect, thus a sudden fall say from 75° to 60° will very probably cause an unexpected flow of urine, whereas a steady temperature of 60° would give rise to no disturbance. The ideal climate, therefore, for a catheter patient is one that is uniformly warm and dry. Unfortunately the opportunity of living in such a residence is open to very few, and the ever changing weather of this country has to be counteracted, at any rate to some extent, by attention to the warming of the house and to suitable outdoor and indoor clothing.

Ideal climate for catheter patient.

Temperature of sitting and bed-room.

Both the *sitting and sleeping apartments* should be kept at a temperature ranging from 60° to 70° F., be well ventilated and free from draughts. A cold bed-room, often many degrees below that just left, is not infrequently the cause of a night disturbed by calls to micturate. The surface of the body is thoroughly chilled while undressing and the perspiration checked. The natural warmth and activity of the skin is not regained for some considerable time after retiring to bed, and consequently more fluid is passed by the kidneys.

The clothes warm enough to prevent patient feeling cold.

The *clothes should be warm*, and appropriate to the season and occupation. The patient should never feel cold under any circumstance. In winter, while driving, there is nothing better than a fur coat or long-sleeved waistcoat lined with wash leather, but this will not be required, of course, while the temperature of the body is maintained by active exercise. The *night attire*, whether in the form of gowns or pyjamas, should be made of thin

The night attire.

flannel. The former should be long enough to reach the feet, with the opening in the middle *extended to the level of the knees.* The penis is then easily reached by undoing one or two of the lower buttons when catheterisation is required, and the necessity for turning up the gown and exposing the lower part of the body avoided. If the patient is habitually compelled to rise for the instrument, it is well to wear woollen bed-stockings, and a caution should be given to those so troubled, to see that *everything needed for the operation is prepared* and near to hand before retiring.

The necessity of having instruments prepared before retiring.

The *bedclothes should be light,* and the patient should sleep between the blankets if able to do so, failing this, to select twill in preference to linen sheets in winter.

The bedclothes.

c. **The amount of fluid thrown off by the lungs** as aqueous vapour is considerable, and depends on the surrounding temperature and on the amount of moisture the air contains before it is inhaled. The best condition, therefore, to ensure expiration of as much watery vapour as possible is, as for the skin, to choose a warm and dry climate. In other respects we can bring very little influence to bear.

Expiration of watery vapour encouraged by a warm dry climate.

d. **The amount of fluid thrown off by the bowels** is insignificant when compared with that which escapes by the skin and lungs. Nevertheless it is most necessary to keep the bowels gently and well moved every day, before the moisture natural to a healthy motion is absorbed by the intestine. If the habit is neglected, and the evacuation of the bowel is delayed until most of the fluid is absorbed, hard *masses are formed which press upon and irri-*

Importance of the daily action of the bowels.

Constipation combated by habit, by diet, and by mechanical means.

tate the bladder. The tendency to constipation may be combated, *firstly*, by going to stool daily at a regular time whether there is a desire or not, *secondly*, by attention to diet, and *thirdly*, by mechanical means. The fæces are propelled along the bowel by successive waves of contraction—commencing at the top and extending to the bottom—in the muscular coats of the intestinal canal. It is naturally much more efficacious when the bowel is moderately distended than when almost empty.

The food should contain fair proportion of materials unaltered by the digestive juices.

The diet should, therefore, consist of foods containing a fair proportion of matter *unaltered* by the digestive juices, such as may be found in vegetables, fruits, and coarse wholemeal bread. To live, for the greater part, on concentrated and nutritious dishes of eggs, milk, and meat essences, which are almost entirely absorbed, leaving little refuse in the bowel, invariably leads to constipation, and defeats the object in view.

Concentrated foods, therefore, contra-indicated.

Constipation is frequently caused by a plug of hard fæcal matter lying just within the orifice of the rectum, and but for this the bowels would act regularly. The obstruction may be removed by introducing a substance which will stimulate the muscles to more vigorous action, or which will lubricate the passage, rendering the expulsion more easy. The two functions are often combined in a suppository, and its use will generally produce the desired effect within half an hour. Its introduction into the bowel is facilitated, especially if the suppository is at all hard, by oiling first, and it should be pushed well into the rectum, and not left within the grasp of the tightly closing orifice. When this fails, or the fæcal

Mechanical means.

The suppository.

accumulation extends higher up, a fairly large quantity of fluid may be needed to soften and break up the impaction. Water is usually all that is required, though other liquids are sometimes substituted.

The enema.

Apparatus for administering an enema.

Many forms of apparatus have been devised to supply the power for driving the fluid into the bowel, but none are more convenient and more easily handled than the old-fashioned Higginson's syphon enema syringe.

Method of doing so.

A can containing a couple of pints or more of warm water at the temperature of about 100° F., and the syringe, is all that is required. Both the suction end and the nozzle are placed in the water, and one or two pumps are given to the ball to expel the air in the apparatus before use. The patient, to obtain the best result, should lie on his left side, with the knees slightly bent and drawn up. The buttocks are brought near the edge of the couch, and the syringe, which has been previously charged, placed near by on a chair at his back. The bone nozzle is slightly greased and pushed well into the orifice of the rectum, the right hand being used, until the shield which surrounds it can be comfortably grasped and retained between the folds of the buttocks. The right hand then gently and slowly compresses the ball, injecting the contents, the pressure is relaxed, the ball recovers its shape, and the process is repeated leisurely some twelve or fifteen times, until sufficient water (from $\frac{1}{2}$ to $1\frac{1}{2}$ pints) has been thrown into the intestine.

General cause of failure.

The patient should rest afterwards for ten or twelve minutes. Success depends a good deal on the temperature of the water and the gentleness with which the fluid is injected. Cold water and roughness nearly always evoke muscular contraction of the intestine, preventing the fluid entering the bowel, or causing the expulsion of the small quantity already there before it has done its duty. The same result is produced if the *point* of the nozzle is not pushed sufficiently in to be free of the orifice of the rectum. Another slight inconvenience which results, is, that the catheter patient is nearly sure to want to empty the bladder before the usual time, as the intestine absorbs some of the injection which is at once passed off as urine.

Administration of drugs

Occasionally obstinate constipation can only be overcome by the use of drugs, but they should be resorted to under medical advice.

Mental excitement causes increased flow of urine.

c. **The nervous excitement.**—The increased activity of the kidneys, and the consequent flow of urine into the bladder, following great mental stress and anxiety is well recognised. The urine is pale in colour, and is excreted quite independently of either the quantity of fluid drunk, or the activity of the skin and lungs. The phenomenon is not uncommonly noticed in patients who worry and distress themselves—very unnecessarily—over the use of the catheter, thereby actually increasing the trouble they are so anxious to avoid. Sexual excitement, especially if prolonged and unsatisfied, produces a similar effect, and it, moreover, renders the bladder irritable by causing congestion of the blood-vessels in the neighbouring organs. Strong emotional stimulation should therefore be avoided whenever possible, and the patient should seek to divert his attention by some congenial occupation.

Also sexual excess.

And should be avoided.

CHAPTER X.

General Treatment *(Continued)*.

III. To Prevent the Occurrence of any Condition which will Reduce the Normal Capacity of the Bladder.

The term *irritability* indicates that the desire to micturate has occurred before the bladder is filled to its usual extent, or to express the same thing in other words, the capacity has, for the time being, been reduced. We have already seen that the collection of fæcal matter in the bowel, and the congestion of the blood-vessels, give rise to irritability of the bladder (pp. 87 and 90). There is yet another important, and in the majority of cases preventable cause of this condition, viz., **inflammation,** which may result from:—

1. The damage done by instrumentation.

2. The action of certain substances (irritants) either (α) excreted in the urine, or (β) introduced directly from without by means of an instrument.

All instruments give rise to inflammation though care can reduce it to a negligible quantity.

1. **Inflammation as the result of instrumental damage.**—No instrument can be passed along the urinary passages without producing some slight amount of damage, and consequently inflammation, although of transitory nature. It is to reduce this evil as far as possible that so much has

been said concerning careful and gentle manipulation (p. 52).

Foods eliminated in the urine as irritants to be avoided.

2. (α.) **Inflammation caused by irritants excreted in the urine.**—Many products the result of the digestion of food are thrown out in the urine; some cause *no* inconvenience, while others act as irritants to the membrane lining the canals. Foods proved by experience to behave in this way, and most people have some such idiosyncrasy, as well as those more generally recognised, among which may be mentioned asparagus, spices, condiments, and gin, should be avoided. None, however, are certain in their action, with the exception of the last, for they produce different effects in different people. Drugs—turpentine, cantharides, cubebs, copaiba and many others—act in a similar manner, and should not, I think, as a rule be administered.*

Certain drugs contra-indicated.

2. (β.) **Inflammation caused by irritants introduced from without by means of an instrument** may be divided into two classes:—

a. Those of a purely *chemical* nature.

b. Those which are *organised*, as are all micro-organisms.

a. Inflammation as a result of a chemical irritant introduced from without.

A catheter before it is used is frequently soaked

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* I have made no mention in this little book—for the subject appears to be rather beyond its scope, and the complication resulting is comparatively rarely met with—of micro-organisms eliminated from the body in the urine, and which are said to give rise to inflammation of the bladder (typhoid, &c.). Nor of those which attack the bladder as a part of a local affection (diseases of the rectum) or in a general infection (tuberculosis, &c). Appropriate treatment must be adopted, as far as possible, to prevent this complication.

Reasons why chemical antiseptics should be avoided in cleansing instruments.

or washed, for the purposes of surgical cleanliness (p. 43), in solutions of either carbolic acid or some other chemical termed an "antiseptic." The surface, too, is anointed with a lubricant impregnated with a similar substance. Now antiseptics, when strong enough to effect their purpose, viz., to kill the microbes on the catheter and in the lubricant, must also, if applied, damage the delicate membranes of the bladder and urethra. This certainly happens with catheters prepared in the manner I have just mentioned. I do not say that one application of the small much diluted dose from one instrument will give any noticeable results, but undoubtedly the accumulative effect of many—four or five doses in the twenty-four hours, and continued day after day—must ultimately produce inflammation, more or less severe. For this reason I do not advise the use of chemical antiseptics, and prefer to rely on *heat*, as the best method of sterilisation (p. 20, *et seq.*), which leaves the instrument and the lubricant perfectly inert when cold.

Preference given to heat.

b. Inflammation as a result of organised irritants introduced by the catheter:—Inflammation produced by the activity of micro-organisms is the most persistent of any form, and has already been incidentally referred to in dealing with sterilisation (p. 19). Its most common cause—which can and should be prevented by scrupulous attention to aseptic precautions—is at present undoubtedly the use of *dirty instruments*. The symptoms of microbic infection are so frequently associated with those produced by retention, that both are confounded together, and are generally described as

Inflammation most commonly produced by microbes introduced during instrumentation.

arising *solely* from one trouble, the most common cause of retention, viz., hypertrophy of the prostate. That the prostate *per se* is not responsible for the development of these symptoms, must be *obvious* to anyone who considers the question. I think, nevertheless, a description of the symptoms and treatment of this complication will not be out of place.

CHAPTER XI.

THE SYMPTOMS OF MICROBIC INFECTION IN RETENTION OF URINE IN THE BLADDER.

THE symptoms are best illustrated by describing a typical case. The patient may either be learning, or already in the habit of using the catheter, at the time the infection occurs.

Premonitory symptoms.

A few hours after the passage of a dirty instrument—the time varying according to circumstances—the patient is conscious of an unusual feeling of discomfort in the region of the bladder; he has not been quite free from uneasiness since the catheter was passed, there are new sensations, of heaviness between the legs, of swelling in the rectum, or of soreness across the bottom of the abdomen. He complains of nothing else in particular, though he is not well, and he feels sick. He tries to get rid of the sensation in the perineum by passing a little water, and is surprised to find that the attempt is accompanied by smarting and scalding along the urethra. Shortly afterwards a chilliness runs down the back, or he experiences a momentary shudder, or a numbness and coldness in the legs and feet, or even repeated attacks of yawning.

Attack develops constitutionally.

The rigor.

This soon gives place to a more pronounced sensation of cold, sometimes accompanied with pain in the small of the back, though the skin is dry, hot, and burning to the touch. His face is white and drawn.

The cold stage

He now commences

to *shiver visibly*, at first intermittently, but, as the attack advances, continuously, the teeth chatter, and the limbs and body shake violently, sufficiently to move the bed. The attack having reached its climax begins to subside gradually, the feeling of cold is replaced by *insufferable heat*, which he tries to relieve by throwing off the clothes. The skin is flushed and bathed with a *perspiration*, so profuse that it literally soaks everything around. The pains leave him, and shivering becomes less marked, and finally disappears. He complains also now of great *thirst*. In the course of an hour or so these symptoms, with the exception of a feverish condition, pass away, and the bladder troubles become more pronounced. The *call to micturate is much more frequent* and urgent, often recurring within ten minutes of the bladder being emptied, and so irresistible that he can hardly restrain it. He is compelled to give way, and struggles, with the assistance of every muscle in the body, to throw off, what appears to be from his sensations a large quantity of urine. Of course the amount may be very little, and that totally unable to escape. The straining fit or "*spasm*" lasts perhaps a minute, increasing in severity to a certain point, and then dying away again, and recurs shortly afterwards, causing much exhaustion, and not infrequently repeated actions of the bowels simulating diarrhœa. The catheter relieves him for a short period, but he is reminded of his trouble by sharp twinges of pain as the bladder is emptied. He complains also of constant pains situated either in one of the parts already mentioned, or in the thighs, or along the

The hot stage.

Subsides.

Acute local symptoms appear.

urethra to the tip of the penis, and all are invariably increased and rendered almost unbearable whenever the "spasms" occur. The urine, which was previously clear and bright when passed, is now cloudy and turbid. It may be of a smoky pink tint, and contains many white floating flakes. Its smell is offensive, and resembles bad fish, rapidly becoming worse after being voided. On standing, a thick slimy deposit of yellowish-white colour, specked with blood, settles out, sticking firmly to the utensil, and requires some considerable movement of the fluid to detach it.

The urine becomes cloudy.

Such are the symptoms connected with the acute stage, which may last, under proper treatment, a comparatively short time. The patient's troubles, however, do not usually end here, especially if he is not particular with the cleansing of his catheter.

Chronic symptoms.

Notwithstanding his previous good health he does not readily regain his strength; he is languid, tiring easily after exercise. He is subject to attacks of *fever*, with night sweats, occasionally to rigors, with a repetition of the acute symptoms. His digestion and appetite are poor. He says he is "particularly liable to catch cold," either producing rheumatic pains in some part of the body, or even affecting the lungs.

Constitutional.

The patient *cannot hold the urine* so long as he did, and rises once or twice in the night to empty the bladder. The call to *micturate is urgent*, and in those who are able to void some urine naturally, must be complied with at once, if an involuntary discharge, wetting the clothes, is to be avoided. Pain may not be considerable, unless the organ is

Local.

fuller than usual, when a "spasm" often results, but he is rarely entirely free from discomfort.

The catheter, especially as it approaches the bladder, is *more difficult to introduce*, it pricks and burns, and is apt, without any roughness being used, to draw blood. The flow of urine through the instrument is often checked or stopped, being blocked by a plug of mucus, or small clot of blood, leading to much inconvenience and troublesome manipulation, or to the urine escaping in a painful stream down the urethra beside the instrument.

The urine remains much in the same condition as during the acute stage. It has lost its smoky pink tint, and the smell may or may not be less offensive; in any case it readily decomposes in the chamber, and requires frequent removal. The deposit is not quite so thick, varying from day to day without apparent cause, but *gritty spicules*, like mortar, covered with mucus are now not uncommonly noticed, as well as specks of blood.

Chronic symptoms generally subside under proper treatment.

Fortunately, these symptoms subside under proper treatment. The patient may continue to complain of some local discomfort, associated with slight frequency of micturition and urgency, or they may be absent, constitutional and general symptoms (fever, attacks resembling influenza, indigestion, aches and pains, coughs and colds, &c.) alone remaining. When the latter is the case, the cause of such ailments is often overlooked, and consequently the treatment adopted probably inappropriate. Whereas a few inquiries as to whether the patient uses a catheter, and inspection of the urine (p. 169), would clear up the diagnosis at once. More rarely all symptoms disappear, and health is, for the time being, quite restored, but with this one exception, the urine is not so bright and clear as formerly. While this changed condition lasts, he is liable—it may not be *for months, or for years*—to sudden and unexpected outbursts of acute symptoms, affecting him either locally or constitutionally, or both at the same time. In fact he has a repetition—though somewhat modified—of the phenomena which ushered in the period of primary infection.

Remote consequences of infection.

And, lastly, the more remote consequences of this septic condition must be mentioned, and among the more common are: bleeding from the inflamed area, wherever that may be; direct extension of the inflammatory process to neighbouring parts; swollen testicle; and the formation of white stone.

Symptoms before and after infection contrasted.

The following table contrasts the symptoms of a patient entirely dependent on the catheter, before and after infection.

BEFORE INFECTION.	AFTER INFECTION.
1. He employs the catheter three or four times in the twenty-four hours.	1.* The catheter is required more often, five, six, seven, eight, or more times in the twenty-four hours.
2. There is no occasion to rise at night.	2.* He has to rise at night to use the catheter.
3. He can delay the operation a reasonable time after the call takes place.	3.* As soon as the desire occurs he must comply, otherwise he has a "spasm."
4. He has no pain, and no difficulty while using the catheter.	4.* There is frequently pain and difficulty in passing the instrument.
5. He is free from discomfort whatever he is doing.	5.* Constant, or recurring discomfort in the region of the bladder, especially when moving.

Before Infection.	After Infection.
6. There is no difficulty in emptying the bladder with the catheter.	6.§ There is often difficulty in getting the urine to run freely through the catheter.
7. The urine is bright and clear, and without offensive smell.	7.§ The urine is cloudy and offensive, decomposing readily in the room.
8. He has no fever and no rigors.	8.§ He is subject to fever and rigors.
9. He has no constitutional symptoms.	9.§ The whole of his constitution may suffer, no organ is free from the possibility of attacks.
10. And is not likely to suffer from any complication.	10.§ He runs the risk of the extension of the inflammation to the neighbouring parts, and to the formation of white stone.

Certain symptoms characteristic of all inflammation, and others of the septic process alone.

The symptoms marked with an asterisk (*) are common to all kinds of inflammation, they apply equally to those arising from damage by an instrument, or the presence of a caustic chemical (antiseptics, &c.), though they abate as soon as the cause is removed, and are more transient than the septic process. The distinctive features of the latter being the persistent turbidity of the urine, which may or may not be associated with one or other of the remaining symptoms (§).

The effect of inflammation of the bladder in a case which still retains the power of voiding some urine naturally, although dependent on the catheter to empty the organ completely, is to produce, in addition to many of the foregoing symptoms, *a decrease in the expulsive power*, the decrease being proportionate to the amount and situation of the inflammation. Thus, if it is severe, and implicates the region in and about the neck of the bladder, where already, most probably, obstruction from enlarged prostate exists, the retention very likely becomes absolute. This is a point of no little importance in the sterile treatment of septic cases, which have apparently lost all power of passing urine naturally. For, as soon as the repeated doses of septic matter cease, the inflammation diminishes, and the bladder may then recover some of its power, especially if no serious structural changes have occurred (p. 105).

CHAPTER XII.

EXPLANATION OF THE SYMPTOMS ARISING FROM MICROBIC INFECTION IN RETENTION OF THE URINE IN THE BLADDER.

Organisms of various kinds.

Parasitic, saprophytic. and facultative.

THE varieties of micro-organisms are innumerable, some possess the power of attacking living tissues, others do not, and only thrive on dead matter, while a third class adapt themselves under favourable circumstances to either food (facultative parasites). To the former class belong those which give rise to an inflammatory condition at the site of their activity in the tissues; to the second, those which alter the urine; and to the third, among others the micro-organisms most commonly found in inflammation of the bladder, *bacterium coli commune.* All manufacture, during their growth and multiplication, substances called "toxins," and it is to the absorption of these poisons into the body that the constitutional symptoms are due.

Characteristic symptoms of acute inflammation.

The reason why inflammation causes urinary troubles.

But, first of all, **the cause of local symptoms produced by inflammation,** must be considered. Acute inflammation is characterised by redness and swelling, due to the congestion of the blood-vessels in the affected area, and also by discomfort, which becomes actual pain when the part is moved or stretched. It is not surprising then, that *the desire to micturate frequently*, follows an inflamed state of so restless an organ as the bladder. The collecting urine quickly distends it sufficiently *to convert the existing discomfort into pain*, and relief is sought, when possible, by expelling the contents naturally, or when that power is lost, in a series of ineffectual muscular contractions, or *spasms*, making the pain far worse than it was before. Frequently repeated spasms and straining, which compress the intestines, often cause diarrhœa. The *pain felt after the use of the catheter* comes from the closing or squeèzing of the affected membrane by the muscular bladder wall, though it is not by any means always felt where the damage is situated, but is referred through the nerves to parts removed from its origin. Thus, trouble in one part of the bladder may give rise to a constant burning sensation in the head of the penis, in another, to aching down the thigh, and so on, little being felt at the seat of mischief. *The inability to postpone micturition*, when the desire occurs, is probably due to the inflammation having implicated the neck of the bladder, where the nervous mechanism stimulating the act is situated, the swelling being the exciting cause, and not the passage of the occasional drop of urine as in health. The swelling, too, of the membrane near the entrance to the bladder diminishes the size of the passage, thereby increasing the *resistance to the introduction of the catheter*, its progress being marked by pain, and often by blood. When the inflammation begins to subside, the violence of the symptoms decrease, but while even chronic infection continues, it is impossible, of course, for the organs to entirely regain their natural habit.

Why pain in the bladder and elsewhere comes after catheterisation.

Why there is urgency and difficulty in the introduction of instrument.

The **constitutional symptoms,** fever, rigors, impaired health, rheumatic pains, &c., as has been

Constitutional symptoms caused by the absorption of the poisons manufactured by bacterial activity.

said, may be caused by the absorption into the system, of the poisons manufactured by the micro-organisms, either from the tissues or from the urine. Wherever bacterial activity takes place, there these products are formed. If the activity is feeble, little may be made or absorbed, producing in an otherwise healthy patient insignificant symptoms, but when he is beset by some ailment, or exposed to sudden cold, the effect is more pronounced, and located very probably in the weakened spot. Of course all toxins are not alike, and although at present we are not able to say what symptoms the various kinds produce, yet it is not impossible we may be able to do so in the future, as the subject is more thoroughly investigated. It will suffice to mention this fact, that the series of phenomena in question, are certainly more prone to follow septic infection of the urinary organs than of any other part of the body, and as the urine is present in the former and not in the latter, the symptoms may be due to the absorption of the toxins manufactured from the urine itself.

Various kinds of toxins.

The possibility of special toxins in urinary troubles.

Severity of attack depends on the kind of microbe, on its virulence, on the dose, and on the natural resistance of the tissues.

The **severity of the attack** depends to a large extent on the *kind of organisms* introduced; although it is also influenced by their activity or *virulence*, the power of attack varying considerably in the same kind of microbe, according to the food on which they have previously lived or grown; and on the number or *dose administered*. The larger the dose and *the more it is brought to bear on one particular part* the greater the effect. Living tissues fortunately possess *an inherent power of resisting the attack*, and some even of destroying microbes with which they come in contact. Anything, therefore, which reduces this resistance, affords the microbes a better opportunity of establishing themselves.

The part played by the urine itself in producing a severe attack.

The urine, of course, is without resistance, for it is not a living tissue, and when retained in the bladder is a most suitable medium for the growth of such organisms as affect it, especially as a portion of the decomposed fluid is being constantly removed and replaced by a fresh supply from the kidneys. It is capable, too, of transmitting *all kinds* of microbes unharmed from one point to another. Thus the inoculation of residual urine may give rise to an inflammation far removed from the original site of infection.

The persistence of the attack due to reinoculation and to the retention of urine.

And, lastly, the **persistence of the disease,** putting aside the question of fresh inoculations, perhaps the most fruitful cause, and one which should always be guarded against, is due to the existing abnormal condition of the bladder. When the organ is healthy and clears itself completely, an attack, although it may be severe, usually lasts a comparatively short time. If, however, the power of expulsion is lost and the lining membrane is thrown into folds and pockets making the emptying, even by the aid of the catheter, a difficult task, the infection is persistent, the stagnant pools preserving and maintaining the organism in a state of activity.

Some of the **structural changes produced by chronic inflammation** must be mentioned.

Alteration produced in the mucous membrane by inflammation.

The MUCOUS MEMBRANE, in addition to its becoming softened and less resistant, is, in many cases, considerably *thickened*—whether through the deposit of new tissue or the determination of fluids to the part cannot be discussed—and consequently the *suppleness* which was previously characteristic is much *impaired or lost.* This alteration in the mucosa is not necessarily uniform throughout, but may affect one part more than another, as may be seen frequently at the base of the bladder, the prostatic urethra, and elsewhere. Again the *contraction of old cicatrices*—the result of superficial and deep septic ulceration, or more rarely of abscess in the submucous tissue—causes either *loss of contractile power, or irregular contraction* in the bladder, or reduction of the holding capacity of the organ itself. The effect, therefore, of septic inflammation of the mucous membrane in a bladder which performs its function well as far as emptying itself is concerned, might be, and frequently is, sufficient to obstruct the outflow, and to lessen the expulsive force. If there is already obstruction, arising from enlargement of the prostate, an exaggeration of the symptoms of retention follows and the chance of regaining, or even of maintaining, any of the natural power is greatly diminished.

Superficial and deep scaring.

The MUSCULAR COAT when called upon to overcome increased resistance to the exit of urine, will, no doubt, under favourable circumstances grow in strength and thickness (hypertrophy). On the other hand, if the struggle has been too severe, actual loss of strength will occur with a corresponding dilatation of the organ (atony).

Changes in the muscular coat.

Hypertrophy or atony.

Patches of local inflammation occurring in these two conditions render the tissue soft and less resistant, and give rise in the former, especially if the muscular coat is involved, *to a thin walled*

Formation of sacs and pockets.

sac, which is pushed through or between the muscular bands, the mouth of the sac having defined margins.

In the latter, where muscular atony has occurred, to a more or less *uniform dilatation*, which occupies the affected area. All these processes, as well as endless variations, may be at work in the same bladder, and their general tendency is to increase the difficulty of emptying the organ, even with the aid of a catheter.

Summary.

Chronic inflammation occurring in a bladder that does not empty itself, may therefore be said, firstly, *to increase the resistance to the outflow of urine* and the difficulty in passing instruments, and, secondly, *to diminish the power of expulsion* and aid materially in the formation of sacs and pockets. There is yet a third result which very probably occurs, if we may judge from the facts gathered from clinical observation, from autopsy, and from analogy with other glands which undergo hypertrophy, viz., that *the continued inflammation and congestion in and about the prostate very possibly leads to the more rapid growth of the gland itself.*

Change in the prostate.

CHAPTER XIII.

THE TREATMENT OF MICROBIC INFECTION IN RETENTION OF URINE IN THE BLADDER—THE GENERAL TREATMENT.

During acute stage the patient kept in bed.

As soon as any of the premonitory signs (p. 95) of infection are noticed, the patient should go to bed at once, and remain there in the horizontal position, certainly until the acute stage (p. 96), which may last some days, has subsided. Even afterwards, when the more chronic symptoms appear, great care should be taken about leaving the warm room, a cold, a chill, may undo all the good achieved in a week. He should not be too anxious "to be out and about again," and should be content for the time being to rest on the sofa in his apartment.

Symptoms disappear, resume usual habits.

Later, when he gets rid of his symptoms, nothing remaining but a little increased local discomfort and cloudy urine, he may resume his usual habits, but he should always hesitate to run any special risks, or to do anything he is not accustomed to in the way of exercise, sea bathing, &c. (also p. 79 *et seq.*).

Local external applications.

The sitz bath.

The bidet.

Pain and also undue frequency of micturition are often greatly relieved by heat applied to the parts in the neighbourhood of the urinary organs, for instance, a hot sitz bath at 100° to 108° F. for five or six minutes is useful, but it wets and exposes the patient a good deal. I prefer the old-fashioned bidet (fig. 33) with water at a 100° to commence with, gradually raised to about 110° by the addition of boiling water from time to time, as the parts become accustomed to the heat. The patient should sit well back so that the buttocks effectually prevent the water from lapping over behind when the parts are bathed. He may continue the bathing with great comfort for ten or fifteen minutes without fear of cold, if he is properly clad with a dressing-gown reaching to the ground and surrounding his legs.

Fig- 33.—The bidet.

Fomentations.

Fomentations are also useful, though they cool rapidly and require to be constantly replaced by fresh ones. A more convenient form is the indiarubber hot-water bottle of suitable shape. The bottle should not be filled too full, and all the air expressed before screwing in the stopper, and a cloth or piece of flannel interposed between the skin and the rubber coat. If the moisture of a fomentation

Indiarubber hot-water bottle.

is also needed, the flannel may be wrung out first in hot water before applying it. Leiter's tube. Leiter's tube is also very efficient and cleanly, though rather more complicated. The coil is applied to the part, and a stream of hot water allowed to circulate through it freely.

Administration of narcotics. In some cases these remedies give no relief, and recourse must be had to narcotics. The various compounds of morphia administered hypodermically, or as a suppository, appear to give the best results. For instance, the severity of a rigor, as pointed out by Mr. Christopher Heath, may be considerably lessened by its use, the drug reducing the activity and spasm of the bladder, thereby preventing the absorption of a large dose of poisonous material from that organ.

The special treatment may be divided, for the sake of convenience, into local and constitutional.

CHAPTER XIV.

SPECIAL LOCAL TREATMENT.

Treatment to prevent any fresh infection.

THE proper treatment must be based on the correct application of the foregoing principles. In the first place we must prevent any possible chance of fresh infection, *by strict aseptic precautions.* If they are relaxed, fresh doses will sooner or later certainly be added, giving rise to a repetition of the initial symptoms, or to an aggravation of those existing. The fact that a case is "septic," as it is termed, is *no excuse whatever* for neglecting any detail. Secondly, we must endeavour to eradicate the cause of mischief, the microbes, and failing that, to remove their products before they enter the system.

To eradicate the micro-organisms.

Drugs may inhibit the action of micro-organisms in the urine, but none discovered to destroy those in the tissues.

Drugs taken by the mouth and eliminated in the urine as inhibitors of growth (urotropine, salol, boric acid, benzoic acid, &c.), and similar substances applied directly to the bladder (iodoform, boric acid), where they are slowly dissolved, may, when properly administered, expel and stop the activity of the *organisms attacking the urine itself,* or which are floating in that fluid. But no medicine applied locally, or given by the mouth, has yet been discovered to kill the microbes established in the tissues. Any germicide strong enough to be effectual, will also kill the superficial layers of tissues, and reduce the vitality and resistance of the deeper parts, preparing, as it were, a larger area of ground for the reception and growth of the organisms. The rational treatment must be, not to destroy the microbes *in the tissues*, but firstly, to build up their resistance to enable them to overcome the infection; and secondly, to remove the fluid—the urine—which contains the manufactured poisons (the toxins), and which transmits the microbes from place to place.

Treatment effected by the use of the catheter, and by washing out.

If it were possible to drain off all the urine as it is formed, and prevent any from remaining in the bladder, no doubt the infection would disappear, nature itself repairing the damaged tissues ; but as this cannot be done except under special circumstances, the use of the catheter, and the flushing of the organ with a weak solution of suitable substances, must be relied upon as a compromise, and fortunately, these remedies give excellent results if only applied aseptically and with perseverance.

The catheter more frequently used.

The catheter should be used more frequently. If the urine is foul, regularly every two or three hours is not too frequent; this interval will very probably be before the bladder is completely filled, and before any desire to micturate has occurred.

Attention to emptying the bladder completely.

Great attention should be paid to the *complete* emptying of the organ, whenever the instrument is used. There should never be any hurry about the operation. The last drops, often "creamy" and thicker than the rest, must be drained off, though there may be some difficulty, requiring careful manipulation, especially if the inside of the organ is rough, and contracts irregularly.

Standing imperative to empty the organ.

Draining the bladder can only be satisfactorily performed while standing, and I therefore advise patients, who for some good reason are in the habit of passing the catheter while lying, to at least rise to their feet, or sit on the edge of the bed, twice a day to perform the act. I would even recommend a patient still suffering from fever to do so, after he has been warmly clad for the purpose, and rather run a slight risk by getting out of bed, than allow an ounce or two of *foul urine* to remain undisturbed in the bladder.

Care and gentleness necessary.

I must here repeat the caution that the utmost gentleness is absolutely necessary in all instrumentation; damage to any part, due either to roughness, or to the presence of caustic chemicals used for the purpose of sterilising the catheter, always increases the risk of infection, and renders the already injured tissues more susceptible to the attacks of existing microbes. Before the days of asepsis, Sir Henry Thompson, the pioneer of urinary surgery, obtained excellent results, to a large extent due, no doubt, to his skill and care in the use of instruments. He impressed upon everyone the importance of this fact, and his advice cannot in any way be modified at the present day, especially in regard to the kind of case we are now considering.

Sir H. Thompson's advice.

The hints already given on the use of the catheter in the treatment of simple chronic retention (p. 79), apply equally to this form of the disease. The effect of inflammation of the bladder is chiefly to *reduce its holding capacity*, and in order, therefore, to prevent the symptoms of over distention—usually the chief cause of trouble—the same rules must be attended to in this altered condition.

Washing out the bladder.

In addition to the more frequent use of the catheter, the draining and cleansing of the bladder is greatly assisted by injections and washing out, commenced from the onset of infection, and continued constantly throughout the chronic stage. It will therefore be convenient here, as it is impossible for a busy medical practitioner to continue the treatment indefinitely, to describe how a patient *may best be taught* to perform for himself this small but important operation, mentioning at the same time the difficulties likely to attend it.

CHAPTER XV.

WASHING OUT AND INJECTING THE BLADDER.

The terms injection and washing out.

THE terms injection and washing out have become to be employed synonymously, and they are here used in that sense, though strictly speaking the former indicates that a solution of a drug is used, while the latter, that the organ is simply flushed out and cleansed with pure water or other inert fluid.

Sterilisation of instrument and fluid.

The same care that has been bestowed in cleansing the catheter, is also essential with the apparatus used in washing out the bladder. Not only has the syringe to be sterilised, *but also the fluid which is to be injected.* Water as it comes from the tap, or as used for drinking, contains large numbers of organisms, and is, therefore, unfit for the purpose. These must first be killed. Of course the addition of a small quantity of the drugs—astringents, antiseptics, &c.—that are used with benefit to the bladder, are quite useless as destroyers of micro-organisms when so dilute, and we must revert to boiling as the easiest and most ready means of securing sterility.

Accomplished by boiling water.

The instruments.

The **instruments** required are :—

The indiarubber syringe.

1. An indiarubber syringe. I find one of four ounces in capacity, fitted with a brass or silver taper nozzle and stopcock, most convenient. The latter is connected to the bottle by a bayonet catch (fig. 34).

and can be easily detached. The bottom of the bottle is flat, allowing it to stand firmly in an upright position if required.

A conical measure glass.

2. A common four ounce conical photographer's measure glass, but without the spout.

Kettle of boiling water.

3. A kettle of *boiling* water.

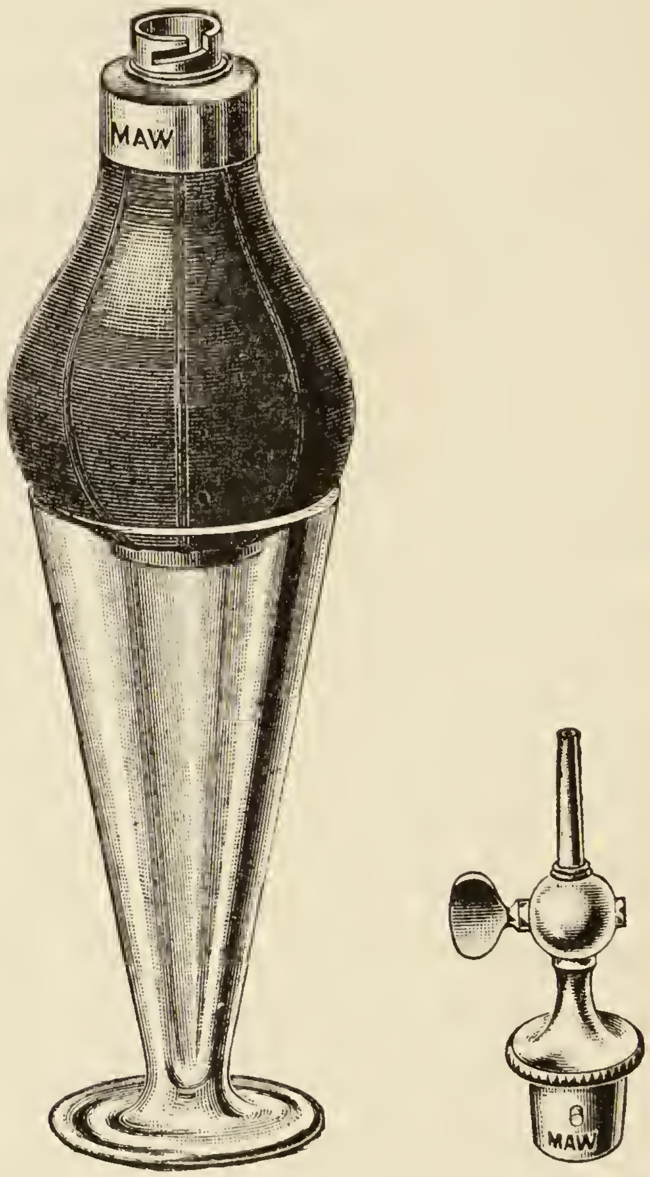

FIG. 34.—Indiarubber injecting bottle ready to be filled.

Method of filling the syringe.

To fill the syringe.—The tap must first of all be opened and then disconnected from the body at the bayonet catch. The bottom of the bottle is allowed to rest, with the neck upwards, in the mouth of the measure glass standing in a basin, and the metal tap placed near at hand (fig. 34). The quantity of the medicament prescribed is put into the bottle, which is then at once filled to the brim with the boiling water. The metal collar surrounding the neck is next held in the left hand, the nozzle replaced and the tap turned off. The whole syringe is now inverted into the glass with the nozzle towards the bottom, and a good stream of boiling water is poured over the whole apparatus until it fills and even overflows the glass (fig. 35). We have thus sterilised the water, the small quantity of the drug used, the inner and outer side of the syringe, and have protected the nozzle from becoming contaminated. The glass filled with water and containing the inverted syringe is placed aside to cool, for the temperature at which an injection should be used is about 100°.

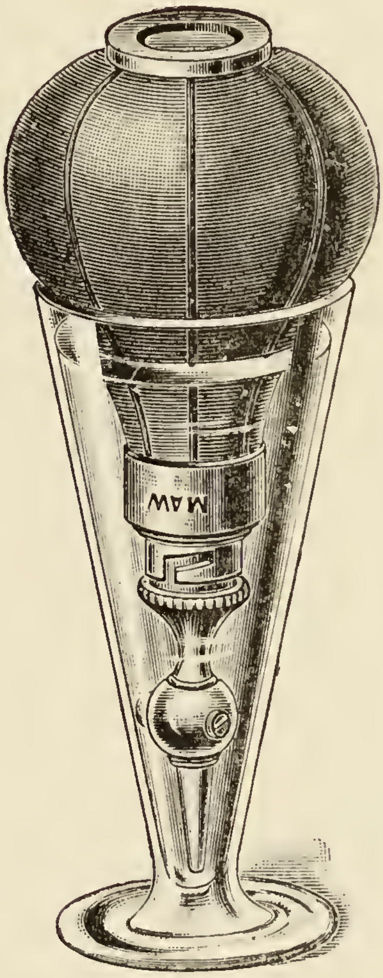

FIG. 35.—Indiarubber injecting bottle filled and inverted into the glass containing boiling water.

In summer it takes about two hours to reduce, and in winter half that time, but the patient must be guided by his own experience.

Position for making an injection.

To teach a patient how to make an injection into the bladder.—The patient should *stand* when possible to make an injection, for the fluid then runs out much more easily, and the likelihood of any remaining behind in the bladder prevented. If he is forced to lie down, the injection must be expelled from the bladder by pressure with the hand on the lower part of the abdomen, this renders the operation almost impossible for the patient to perform unassisted.

The usual time for injecting.

It is usually made at the *habitual time of catheterisation*, immediately after the urine has been withdrawn, the eye of the instrument being just in the bladder, and two inches of the external end, previously cut slanting (p. 11), remaining outside the orifice of the penis.

Position of left arm and hand.

The left elbow is pressed firmly to the side of the body, and the tip of the first finger and thumb hold the catheter three-quarters of an inch from the external end (*the place*), while the remaining fingers support the penis beneath, keeping both horizontal and in the middle line. This position, except when the tap has to be turned, should be kept throughout the operation and the catheter must not be allowed to move, neither pushed into the bladder when the nozzle is connected, nor pulled out when it is separated.

Position of the syringe in right hand.

The syringe is taken out of the glass, from whence it has not been removed before, and held in the right hand, the indiarubber bottle resting on the

Joining the syringe to the catheter.

The tap opened and half the contents injected.

The tap turned off.

The syringe disconnected and the fluid allowed to run out.

upturned palm with the nozzle pointing at the patient, and the handle of the tap being towards his left (fig. 36). The fingers and thumb now surround and slightly compress it. The syringe, while still held in this manner, is brought horizontally into the middle line, and the right elbow being supported against the body, the nozzle is thrust firmly into the cut end of the catheter. The hold on the catheter with the left hand is entirely relinquished, while the tap is opened, but is resumed again immediately after. Half the contents of the bottle are now thrown into the bladder by gentle and continuous pressure of the right hand, and, while the inward flow of the injection is thus still maintained, the tap is turned by the left in a manner precisely similar to the way it was opened. The finger and thumb are then returned at once to "*the place*" occupied at first. With a slight screwing movement of the right hand the syringe is easily separated from the catheter, and the fluid begins to flow from the bladder through the instrument into a vessel standing beneath. It is better now to let the catheter take up its own position and hang freely; the left

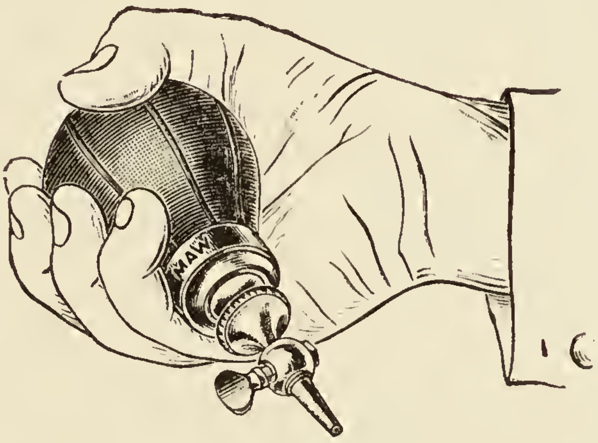

FIG. 36.—Patient holding indiarubber injecting bottle ready to inject himself. (The tap should have been represented as turned off).

Doubling up the bottle to inject the second half.

hand being used meanwhile to assist the right in doubling the rubber bottle longitudinally, in order that a more firm grasp may be obtained to expel the second half of the injection. When the fluid stops running out of the catheter, it should be moved slightly backwards and forwards with the left hand (p. 54) to make sure that the bulk of the fluid has been returned, though this proceeding is not so important at this stage as it is just before the catheter is removed.

Repetition of process.

The next step is to throw in the remainder of the injection. The same method is adopted as before. The catheter is kept in position with the left hand; the doubled up bottle is grasped with the right and the nozzle connected with the catheter. The tap is turned with the left, which then returns to the "place." Steady pressure on the indiarubber ball, continued until after the tap is turned off, causes a continuous jet of fluid to pass into the bladder. The syringe is then disconnected by half a turn or so of the nozzle, and the injection allowed to run out of the bladder.

Difficulties experienced by beginners in emptying the bottle, and in getting the injection to return.

Many patients to begin with, find some slight difficulty in squeezing the bottle sufficiently to expel its contents, though a little practice will soon overcome this defect. Of course, the bottle can never be entirely emptied, some half ounce or so will always remain behind, no matter how much pressure is exerted. Sometimes one is surprised to find that the fluid does not return after disconnecting the bottle from the catheter; the eye of the latter has probably been inadvertently pushed too far into the bladder, or else pulled out into the urethra

The cause and the remedy.

where it is effectually blocked by the lining membrane. A little patience, and moving the catheter in one direction or the other, will quickly rectify the mistake. Again, if caustic solutions are injected while the catheter is in the urethra, pain or discomfort quickly follows, produced by the action of the drug on the more sensitive membrane of the passage. Pain is likewise experienced in this case if a fluid is injected too rapidly, and the closed narrow channel suddenly over distended. One other complication sometimes arises: while injecting, a markedly increased resistance is noted in the right hand, and at the same time the patient is conscious of a great desire to micturate. If these signs are disregarded, and more fluid is forced in, the desire becomes so intense that restraint is overcome and the fluid escapes beside the catheter, or a spasm may occur. The treatment is, of course, to disconnect the syringe as soon as the symptoms occur, and allow the fluid to escape by the catheter, and to restrain the desire to pass water by the natural efforts. The accident is induced either by a small quantity of the injection entering the passage—the eye of the catheter not being well in the bladder—or the solution is itself too strong, or too much fluid has been thrown into the bladder, these mishaps therefore must be avoided by attention to the preceding details.

Pain following injection.

Involuntary contraction of the bladder wall while injecting.

Its cause and remedy.

CHAPTER XVI.

THE TREATMENT OF MICROBIC INFECTION IN RETENTION OF URINE IN THE BLADDER—SPECIAL LOCAL TREATMENT *(Continued).*

THE patient having been taught the art of washing out, will next require to know how best to apply the remedy, and the following hints may be of service in advising him.

The number of times in the day the injection is made depends on the condition of the urine.

The number of times the bladder is to be washed out in the day depends on the condition of the urine. If it is only cloudy—it must be examined in a clean glass vessel—once will probably suffice, but if offensive and thick more frequent injections, two, three, or four times a day, may be needed.

Rest afterwards is advisable.

The time for injecting.

The *patient should rest* in the recumbent position afterwards, and it is well, therefore, to wash out before going to bed, provided—and this certainly should not occur—a restless night does not result on account of pain. When more frequently required, the morning and midday are convenient hours.

The continuance of the treatment.

The condition of the urine, too, is the criterion for the *continuance of the treatment.* As long as it remains cloudy the injections should be used. Treatment day after day and week after week may be necessary to produce a satisfactory result but happily it usually comes in the end, if we only have patience and perseverance. Thus, it should be undertaken and continued in cases where the constitutional symptoms are predominant, the local sign being cloudy urine alone ; as also it should be even when these constitutional troubles have ceased —being adopted with the idea of ridding the bladder of infection, and preventing the possibility of any outburst in the future.

The advisability of using more than one bottle.

Frequently more than one bottleful—two or three perhaps—must be used when an injection is made, *i.e.*, until the returned fluid is clear, and free from the debris and mucus washed from the bladder wall. Again, where the bladder has folds and pockets, as is not uncommon when bladder troubles have existed for a considerable time, the whole of the contents of the syringe may, with advantage, be thrown in at once, instead of in two parts. The extra fluid dilates the organ rather more fully, smoothing out the creases, thus liberating any urine concealed in the recesses, and allows the solution to be applied to all parts of the surface. As a general rule, however, it is better to trust to the injection of small quantities thrown in with moderate force. The gentle current playing on the bladder wall washes away the mucus, debris, &c., and causes little distension and consequent disturbance.

When total contents of the bottle may be thrown into the bladder at one time.

The failure of the treatment. Want of sterility and gentleness.

Failure in treatment by injection arises chiefly from two causes : firstly, the want of *sterility*, more especially in regard to the fluid injected, which is often not subjected to any process of sterilisation ; and secondly, *from a too great desire to perform the operation thoroughly.* Large quantities of fluid, 10, 14, or more ounces, are often *rapidly* forced into the bladder at a single injection, and totally irrespective of the existing inflammation; the proceeding being repeated more than once. Not only may the pain then be considerable, but the inflammation—the disease we are treating—must be hereafter augmented by such violent and unnatural movements. I am convinced in this instance, as in all treatment, that sterility and gentleness form the keynote to success. The more carefully we practice surgical cleanliness and the more nearly we simulate the natural act—the gentle dilatation and contraction of the bladder—the better results we obtain.

Summary.

To recapitulate, the objects of washing out and injecting into the bladder are:—

1. To expel, or inhibit the activity of, the microbes—which may be parasitic or saprophytic—from, or in, the urine (p. 102).

2. To remove the products of microbic activity from the organ to the outside with as little disturbance as possible.

3. To prevent decomposing urine, which the catheter is unable to remove, remaining in the bladder.

4. To apply such remedies to the damaged tissues as may help them to resist the attacks of parasitic organisms.

Solutions useful as injections.

The following preparations are among those I have found most useful in washing out and injecting the bladder. First and foremost, nitrate of silver varying in strength from half a grain to one grain to the *four* ounces of water. The following is a convenient formula;—Argent. Nit., gr. xvi., Ac. Nit. Dil., ♏x., Aq. Dest., ad ℥ij., 30 to 60 minims being added to the bottleful as required. Soloids are also made of one grain, which are useful when the strength is constant. Among others may be mentioned :—

Boric acid, 5 grains* to the four ounces.

Barff's boroglyceride, 5 grains to the four ounces.

Bicarbonate of soda, 3 to 5 grains* to the four ounces.

Sulphate of zinc, 1 grain* to the four ounces.

Dilute acetic acid, 30 minims to the four ounces.

Listerine, 1 drachm to the four ounces.

Ammonia, 2 to 3 minims to the four ounces.

Lysol, 1 in 5,000.

Perchloride of mercury, 1 in 10,000.

Normal salt solution.*

* Soloids are made of these drugs.

CHAPTER XVII.

The Treatment of the Constitutional Symptoms of Infection in Retention of Urine.

Few hints can be given to patients on this point. The treatment must be left entirely to the discretion of the medical adviser, the special symptoms being dealt with as they arise, and according to the individual. Of course the main treatment must be, as we have seen, to strike at the root of the evil, but a good deal of assistance may be given by improving the health, and by following out the general advice laid down for catheter patients with regard to diet and regulation of the bowels, &c. (pp. 79-90). There is, however, one symptom, the rigor, which will usually have disappeared before medical aid can be obtained, and it will be well, therefore, to give patients some general instructions to be adopted directly it occurs, and before it has become thoroughly established.

The patient to go to bed between the blankets.

The treatment of the rigor.—As soon as the patient feels chilly, he should at once retire to bed, getting between the blankets in preference to sheets. Every part of the body, even the hands and arms, should be well wrapped up, the covering being thick, but light. He should be liberally supplied with hot water bottles to the feet, and, if he lies on his back as he often does, to the sides and lower part of the abdomen and perineum. Hot fluids—weak

Hot bottles applied.

Hot drinks given.

tea perhaps being the best—may be advantageously administered, though the use of alcohol is not to be recommended unless under special circumstances. Every endeavour, in fact, should be made to throw the patient into a perspiration. When the cold stage has passed, and the patient begins to perspire, the greatest care is required to prevent him chilling the skin too rapidly by throwing off his coverings. Certainly some of the blankets and hot water bottles may be removed, but the cooling process should be done very gradually. The clothes, which are now very probably wet, should not be changed until the symptoms have subsided, and all signs of shivering have ceased, and even then the clean nightdress should be first well warmed and aired. The face and head should be dried with a warm towel, and after the attack is over the skin may be sponged with warm water and carefully rubbed afterwards. Any further treatment, if such should be required, must be left to the medical man, but these few hints will suffice in most cases to relieve the patient, for the time being, and probably ward off a repetition in the immediate future.

Care exercised to prevent the skin being chilled.

Cooling gradually.

The clothing changed.

Rubbing with warm towel and sponging with warm water.

THE QUESTION OF OPERATIVE INTERFERENCE IN RETENTION OF URINE.

A large class of patients suffering from retention of urine, pay little or no attention to surgical cleanliness in the use of their instruments, and in treatment. If they do, the precautions adopted are so ineffectual or so perfunctorily performed, that they might almost as well be disregarded. Of course all these,

Neglect of aseptic precautions and the result.

sooner or later, become septic, some escape the dire effects, and live fairly comfortably after perhaps one or two sharp attacks. But a large proportion, from the frequent *re*-inoculation, develop symptoms both local and constitutional, which may be more severe and prolonged than those already described (pp. 95-101). The patient is then frequently prostrated by fever. His catheter is hardly ever out of his hand, either by day or by night. He is worn out by the want of sleep, and by pain, and if he lays his instrument aside he is quickly punished for his negligence by the most dreaded of symptoms, a bad "spasm." The urinary organs demand his whole attention, and his life becomes a burden beyond endurance. To relieve the sufferer, operative interference is now frequently suggested. The most commonly recognised cause of obstruction is hypertrophy of the prostate, the *greater part* of which is removed by operation, and frequently with it, also, a *considerable portion* of the urethra.* The urine then escapes from the bladder for some distance, apparently without difficulty, through a newly formed channel, and the septic condition, if not cured entirely, is at any rate considerably ameliorated, by *stopping the frequent fresh inoculations*, and by affording free drainage. The operation, from recently published statistics, appears to give promise of some success, yet I think on account of (1) the risk an aged patient runs from so severe an operation†; (2) the comparatively long confinement to

Relief by operation proposed.

Parts removed.

Advantage.

Disadvantages.

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* Mr. S. G. Shattock's report to the Pathological Society (*vide Brit. Med. Journal*, Oct. 24, 1903, p. 1071).

† The mortality in recently published cases is fully ten per cent.

bed at a time when the expectation of life can be but a few years; and (3) the enormous benefit sterile instrumentation and treatment confer upon the majority of cases, that it should be reserved for exceptional conditions, and not employed until all other treatment has failed to give relief. The primary object in the treatment must surely be to prevent contamination of the urine and organs, or if by mischance they become septic, to prevent the introduction of fresh doses of micro-organisms, thereby eliminating, as I believe, *the cause of symptoms which, in the large majority of cases, render the operation necessary.* For, I presume, no healthy man, especially at the age of sixty, would be willing to risk his life, and also to sacrifice say six weeks out of his remaining span—and that, too, spent in discomfort—*solely for the sake of ridding himself of having to pass a sterile catheter two or three times a day.* The case just cited may seem to be an exaggeration, but it is an actual fact that catheter patients who keep the urinary organs *free from infection, and re-infection,* are frequently able to hold the urine in comfort longer than those who pass urine naturally. Such patients are now, no doubt, rare, but will become far more common when the great principles involved, those of asepsis, are appreciated, and applied from the outset of catheter life.

Sterility primary object in treatment.

It is also urged by some, who willingly admit the force of this argument, that operation still offers the best solution of the difficulty: for they say the ordinary run of men do not understand the principles of sterility, and cannot therefore grasp the all important details, and infection must quickly follow. From

Can a patient keep himself surgically clean?

personal experience I cannot endorse this opinion; I find the generality of people deeply interested in matters relating to micro-organisms, and highly appreciative of details if a satisfactory explanation is given. Nevertheless, to meet the requirements of all classes I consider that it is of the greatest importance that everyone should be thoroughly drilled in every step (in sterilisation, in manipulation, &c.), until he carries out the whole process mechanically without thought or hesitation. It is perfectly useless, and I might add, with our present knowledge, almost criminal, to tell a patient to use a catheter or to make an injection, without giving him very explicit directions, and without pointing out to him the danger he runs, if he does not keep his instruments sterile. Of course the medical man who is called upon to teach a patient must have an easy though comprehensive plan prepared beforehand. In the belief that such a plan is wanted I have endeavoured, in the preceding pages, to formulate a scheme, which may be of service to him in carrying out the idea of sterility, which will prevent many if not all the serious complications now so frequently seen in connection with retention of urine.

Sterility attained by systematic teaching on definite lines

CHAPTER XVIII.

STRICTURE OF THE URETHRA, THE SYMPTOMS AND TREATMENT.

Definition of a stricture.

"A STRICTURE is a deposit of inelastic tissue at some point round the canal of the urethra, which, not permitting the canal to open to the pressure of the stream of urine, narrows the current to a greater or less extent."* The deposit is almost always produced by some inflammatory action (gonorrhœa), or more rarely by an accident which tears or damages the urethra or neighbouring parts. Both causes lead to a destruction of some portion of the organ implicated, nature effecting the repair of the injury with a tissue less distensible, and liable to contract, and so to cause a narrowing in the course of time. It is well to call to mind when considering the symptoms and treatment that "the urethra is not an open tube, except at the moment of its distension by an out-flowing current it is always absolutely closed, and only when it is habitually prevented from fully dilating to the stream of urine is it affected by stricture."*

The cause.

The kinds

The kind of stricture depends, therefore, on the position, and on the amount of the repair. It may involve the whole circumference of the urethra for a considerable distance, giving rise to a broad band surrounding it, or limited to one side or to the floor for a short distance, producing a ridge or fold across the lumen of the canal, or finally, the repair may have taken place in two or three places, so that the same number of strictures result. Nearly seventy per cent. of the strictures which occur are situated between 5½ and 6½ inches from the external orifice, the remaining thirty per cent. being equally distributed over the penile portion of the urethra.

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* "Clinical Lectures on Diseases of the Urinary Organs," by Sir Henry Thompson.

Position.

Mechanical effects of stricture.

The effect of interposing a rigid non-dilatable section into the middle of an elastic passage which conveys a fluid in a full steady stream, is (when the channel through the obstruction itself is not very small) to decrease the force, but not, to any appreciable extent, the size of the stream ejected; when the contraction becomes more pronounced the size, as well as the force, lessens. It follows, therefore, that the quantity of fluid evacuated in a given time will be less, provided the pressure from behind remains the same.

Again, the increased resistance offered to the outflowing stream will cause the distensible canal behind the obstruction (*i.e.*, the part nearer the bladder) to dilate beyond its usual wont. This, coupled with the fact that frequently the elasticity is lost in the neighbourhood of the trouble, allows a small quantity of fluid to accumulate there, which is either retained (*i.e.*, becomes residual urine in the urethra) or slowly dribbles away after the propulsive power behind has ceased to act.

THE SYMPTOMS OF STRICTURE.

Let me now describe an ordinary case of simple stricture and see how far the actual symptoms bear out, and are accounted for, by these mechanical principles.

The onset slow, but the disease generally declares itself before middle life.

The *onset* is usually very insidious, no symptom of the complaint being noticed, probably, until several years after the last trace of gonorrhœa (even the tiny shred floating in the first portion of the urine voided) has disappeared. It is, nevertheless, a disease which usually declares itself before middle age.

Premonitory symptoms.

The patient then occasionally becomes aware that the force of the stream is not so good, that he takes longer to micturate, and exerts himself, almost imperceptibly, to expel the urine, perhaps, too, he passes it rather more frequently during the day, though he is not troubled at night. The occurrence of these symptoms, depends, at this stage on a variety of circumstances.

Symptoms increase.

Later on, these symptoms become more marked, he has to expel the urine by calling into play the abdominal and other muscles of the body, in fact, *to strain*, while standing with his legs rather apart and his body bent. He is surprised to find that the extra exertion gives him smarting pain between the legs sometimes extending along the line of the urethra towards the rectum, which is replaced, after micturition is over, by aching which continues for some minutes. He is troubled, also, by the time it takes to get rid of the last few drops, which seem to be retained in the passage, and he is annoyed, even after the greatest patience, to find that he has wetted his shirt after adjusting his dress.

Twisting and forking of the stream.

Formerly much stress was laid on the twisting and forking of the stream as a symptom indicative of stricture. I cannot say that my experience corroborates this statement in any way. It is the shape of the orifice, and the position of the prepuce, which determine the shape of the stream, and not the stricture, unless that is very near the extremity of the penis. To exclude nevertheless the possibility of there being a stricture in this position it is well to make an examination.

Severe symptoms

When the stricture is very tight—though I presume a patient will seek advice long before this stage is reached—the stream itself decreases in size, and the urine is discharged drop by drop, or is thrown out with much straining in little spirts. The frequency of urination, and the pain are intensified, and the difficulty then experienced of emptying the bladder completely, often leads to the gradual accumulation of urine in that organ, thus adding the symptoms of retention to those already existing (p. 67).

TREATMENT OF STRICTURE.

Treatment—the restoration of the natural size of the urethra by bougies.

The treatment is to restore the passage throughout to its natural calibre, either by inserting tapering instruments (pp. 12 to 16) through the rigid and inelastic tissue, or by other means which cannot be discussed here. In order to do this satisfactorily, the whole passage must be distended to a size larger than natural, the great elasticity of the part preventing harm being done, thus, a stricture should be dilated up until an instrument equal to No. 12 on the English scale (p. 16) passes easily, though the normal stream—which may be taken as the criterion of the urethra's ordinary size—has never been larger than a No. 8. Treatment should be undertaken directly the stricture is discovered, for not only is it then more easily overcome, but the alteration in the urethra and bladder, which follows in the wake of an old-standing case, is entirely avoided.

Undertaken as soon as stricture discovered.

In this small book we have nothing to do with the means adopted to bring the stricture to the size required, our concern is simply to give patients advice how to maintain it after that size has been reached. For the maxim must never be forgotten "once a stricture always a stricture," and if neglected, it invariably reappears. There is no treatment either operative or otherwise which can possibly do away with the stricture, you may cut, burn, or apply electricity to it, but you *cannot get rid of the tissue* which repairs the original wound. Fortunately very little attention suffices to keep the patient entirely free from trouble, but there is no way of escaping from this imposition.

Instruments required.

Two, or perhaps three instruments, are required for the purpose; when conical metal dilators (fig. 11) are used, Nos. 9 to 11 and Nos. 10 to 12; or when taper bougies (fig. 12) Nos. 10, 11, and 12 (English scale). When all the preparations with regard to sterilisation have been made (pp. 20 to 41) the instruments, beginning with the smallest, are passed,

Bougies passed one after the other, beginning with the smallest.

one after the other, each being *withdrawn directly* it has been fully inserted. No advantage is gained by allowing the bougie to remain a short time in the stricture, and I do not advise it, although it is frequently recommended. The introduction of metal dilators is sometimes facilitated by first passing a No. 7 or 8 soft taper bougie, though more is gained by gentle manipulation.

The frequency of their use settled by experiment.

The bougies may have to be employed once in three weeks or once in six months. The frequency of their use depends on the behaviour of the stricture itself; on how quickly or how slowly the tissues contract, and is only settled by experiment. If at the end of a three week's interval, the largest bougie enters quite well, another week may be added, making a month; if it then passes without difficulty, the next day for instrumentation may be six weeks afterwards, and so on, until some slightly increased resistance to the introduction is noted, after which the period must not be lengthened. The patient must continue to pass the instruments regularly at these intervals, but in course of time some alteration may be required. Rest is advisable after instrumentation, and perhaps, therefore, bedtime is the best hour for operating.

Rest after instrumentation advisable.

Meddlesome instrumentation to be avoided.

Meddlesome instrumentation is, of course, to be avoided. Using, say, a No. 7 or 8 bougie on one day, 8 or 9 the following, and so on, can only be harmful, for it causes a chronic inflammatory condition of the stricture, which often gives rise to bleeding, retention, and other complications. The stricture should be well dilated, and then left alone until it recovers entirely from the bruising and

The stricture well dilated and then left to recover.

Reaction after dilatation.

swelling. The swelling in the stricture which follows the act of dilatation, accounts for the phenomenon known as *reaction*. The stream an hour or so after a bougie has been passed is strong, better than it was the day before; but later, the next day—that is when the swelling of the membrane over the stricture is most marked, and the channel correspondingly diminished—it has decreased in strength and size, so much so that one wonders whether the dilatation has not done more harm than good; but on the third day one is pleased to find that the stream is better than ever, for the swelling and bruising have by this time subsided.

False passages.

Many patients are afraid while passing bougies of tearing or damaging the urethra, even sufficiently to establish an artificial channel or "false passage" among the surrounding tissues. Such an accident is uncommon, and is very unlikely to occur if the stricture has been properly dilated from the beginning, and the patient uses the instruments confidently and well. If it should occur the results, as a rule, need not be serious, though instrumentation is for a time considerably embarrassed by the fact that there are two ways along which the instrument can pass, yet the false passage can be avoided by care, and will then soon heal. More often a transverse fold or pocket of the lining membrane near the stricture is mistaken for a false passage. The bougie passes down the urethra quite easily for four or five inches, and then comes to a stop, withdrawing and re-introducing it, leads to exactly the same result. It will not pass, and on exerting extra pressure it springs onward with a jerk, and a

Transverse fold mistaken for false passage.

few drops of blood soon appear at the end of the penis. The patient at once comes to the conclusion that the instrument has penetrated the walls of the urethra, whereas the truth is, that in disengaging the point from the fold entangling it, the extra force has drawn a few drops of blood from the surface of the membrane. It is curious when once this difficulty has arisen, how likely it is to recur; it is most easily overcome by carrying out the instructions on pages 52-65, especially in regard to gentle continued pressure, and thoroughly extending the organ.

CHAPTER XIX.

STRICTURE COMPLICATED BY INFECTION.

Severity and persistence of infection in stricture.

WE must now study the effects of microbic infection in stricture. What has already been said in Chapter XI., relative to the severity and persistence of an attack of septic infection in connection with retained urine in the bladder, applies here, though the symptoms, both local and constitutional, are modified by the altered position of the disease. The presence of the microbes at the seat of mischief may be accounted for (1) by the gonorrhœa, itself due to specific organisms, never having been entirely cured; (2) by their entrance from *outside*, as not infrequently occurs when the stricture is situated near the orifice, and is tight enough to materially influence the size of the outflowing stream of urine; and (3) the most common source, by their *introduction on a dirty instrument.*

Presence of micro-organisms accounted for

The question will then at once arise: how is it that the microbes only attack the tissues in the neighbourhood of the stricture? and the answer is: because the tissues of and near the stricture are the least resistant, and their resistance has probably been further reduced by instrumentation, and because the urethra above the stricture does not *completely* empty itself of urine. The healthy parts are undoubtedly attacked, when pathogenic organ-

Why they attack the stricture.

isms are present, if damage has been done by rough and clumsy manipulation, as many have cause to know.

THE SYMPTOMS.

The symptoms produced by microbic infection in stricture may be said to be local and constitutional.

Local symptoms produced by swelling.

The local symptoms.—The *swelling*, always associated with inflammation—though that produced by septic infection is the most severe and persistent—affects the membrane lining the stricture, thereby narrowing the channel still further. The consequence is that a simple stricture, which has previously been unnoticed, when infected, suddenly develops all the symptoms of a bad stricture, *i.e.*, straining, pain, frequency, &c., which continue with more or less severity while the infection lasts, but with *two additional local troubles*, viz., (1) constant discomfort at the seat of the stricture; and (2) a discharge, noticed either at the end of the penis, or as heavy shreds and cloudiness in the first few drops of urine voided.

Symptoms produced by the septic condition.

Residual urine in the urethra.

The quantity of urine blocked back in the urethra is increased, and will very probably in its turn become infected, as the microbes are at the site of stricture. The contamination may be either with organisms which decompose the urine itself, or with those which can be transferred in an active state to other parts, there infecting the tissues and giving rise to inflammation. For instance, inflammation of the bladder, or cystitis, occasionally follows the passage of a dirty bougie, although the point of the

The spread of infection.

instrument has only just penetrated the stricture which is situated some inches from the bladder.

Remote consequences

The more remote consequences, are inflammation of the testicle, or other neighbouring organs, by the direct extension of the micro-organisms from the original site, along the passages connecting them together. The formation of white gritty material from the urine, which is deposited on the tissues, near the stricture, or which may form actual stone; also the production and collection of pus in the tissues (abscess), which bursts either internally into the passage, or externally, leaving an artificial channel through which the urine may ultimately find its way.

Constitutional symptoms.

The **constitutional symptoms** are in every way similar to those occasioned by infection of retained urine in the bladder (p. 95). Perhaps they are not quite so persistent or pronounced, unless in very bad cases, probably because the quantity of urine exposed to contamination is not so large. Certainly the passage of a dirty bougie through a tight stricture is more likely to produce a rigor *immediately* than a dirty catheter easily introduced into the bladder for the purpose of withdrawing residual urine. I believe the explanation is to be found in the fact that the bougie injures the tissues near the stricture sufficiently to render them susceptible to infection, while the catheter causes no appreciable damage to the passage, and the symptom does not declare itself at once.

The following table contrasts the symptoms of a stricture with those occurring after infection has taken place.

STRICTURE.	STRICTURE AFTER INFECTION.
1. Symptoms due to mechanical obstruction.	1. Symptoms of mechanical obstruction intensified, a slight stricture taking on the character of a tight one.
2. Pain only present when the urethra is distended by the current of urine.	2. Constant pain at the seat of disease, increased by micturition.
3. No shreds in the urine. No discharge.	3. Discharge or shreds in the urine.
4. No remote consequences except those associated with direct backward pressure, which only occur when the stricture is neglected.	4. In addition to consequences from backward pressure, the patient is liable to swollen testicle, cystitis, abscess and white stone.
5. No constitutional symptoms.	5. Constitutional symptoms, rigors, fever, pains affecting the various organs of the body.

A practical rule for determining whether a stricture is infected.

The presence or absence of the shreds in the urine, as also its clearness or cloudiness, in retention of urine in the bladder, indicates to a great extent whether the urethra is contaminated or not. With this exception every symptom may disappear, but on the slightest provocation—either from allowing the stricture to contract, or from roughness in instrumentation, or some other trivial cause — an outburst of local and constitutional trouble, either separately or together, will occur. The importance, therefore, of examining the first portion of urine voided, in obscure diseases, is apparent.

GENERAL TREATMENT.

Patient keeps his bed.

The same precautions, relative to the patient keeping his bed, must be adopted in the acute stages of this disease as in other infective troubles (p. 108). The symptoms may abate quicker and the patient be able to resume his vocation sooner, though he should be exceedingly careful of so doing, if there is still any slight elevation of temperature. The diet should be light and the bowels well moved daily. Alcohol, as a rule, should be avoided, though it may be desirable to drink freely of non-stimulating fluids.

Diet.

Special Local Treatment.

Treatment.

1. To restore the size of urethra.

2. To expel the micro-organisms.

The treatment must be directed, *firstly*, to restore as quickly as possible the natural calibre of the urethra, for with its restoration all the symptoms arising from obstruction will disappear, and *secondly*, to expel the micro-organisms and remove the poisons they make, before they enter the system, and so prevent the occurrence of any constitutional symptoms.

Inflammatory swelling first reduced by heat.

1. The narrowing in these cases, at least during the acute stage, arises as we have already seen, from the stricture itself, and from the inflammatory swelling in the neighbourhood. The latter, unless urgent symptoms demand immediate surgical interference, should first be reduced, and there is no more safe remedy than heat applied by one of the numerous methods already enumerated (p. 108).

The dilation of the stricture to a full size can only be carried out by the surgeon, though of course afterwards the patient must pass instruments at stated periods, if the stricture is to be prevented from contracting again. The rules that regulate their use are the same as for simple stricture (p. 135).

Expulsion of micro-organisms assisted by dilatation of urethra.

2. The foregoing treatment will necessarily assist the expulsion of the micro-organisms. In the first place, by providing free drainage, it will remove a fruitful cause of their continued activity, viz., *the urine retained in the urethra.* Again the restoration of a full stream will flush and wash away any products collected in the urethra, and cleanse the affected area. It is, therefore, a good plan when the channel through the stricture is large enough to admit of a fairly good stream being passed without straining, to encourage a copious flow of urine by drinking plentifully of fluids. In the same way, although the proceeding must only be entrusted to skilled hands, washing out the urethra with sterile water by means of a suitable syringe, is often beneficial. The activity of the microbes may also be hindered by drugs, administered either by the mouth, or applied directly to the seat of infection by injections.

Copious flow of urine to be encouraged.

Microbic activity inhibited by drugs administered by the mouth or applied directly.

Sterility absolutely essential in all treatment.

It is hardly necessary to insist again on sterility in the treatment, every bougie and every injection must be sterilised first, even if the case is, or has been, infected. The worst strictures are to be found among those who have been subjected to repeated attacks of inflammation due to the use of dirty bougies. A patient, who thus treats himself, is inducing over and over again a similar process to that which first gave him the stricture, or to put it in the concise words recently used by Sir Henry Thompson, "he is cultivating his stricture, not curing it."

THE TREATMENT OF CONSTITUTIONAL SYMPTOMS.

Little of use can be said to the patient on this subject, although many symptoms may be attributed to heart, lung, and digestive disturbances, *all will subside* as the urethra recovers its natural condition. Special symptoms can only be dealt with by a medical man as they occur. The rigor is precisely similar to that which often accompanies retention of urine in the bladder and is treated in the same manner (p. 126).

THE QUESTION OF OPERATIVE INTERFERENCE IN STRICTURE.

Strictures rarely require operation.

Moderately narrow strictures, that are not complicated by infection, rarely, if ever, require operative measures—that is, the free division of the non-dilatable band by some cutting instrument—though I must exclude those that result from accident. Operations are only necessary (1) when the patient suffers from the effects of *sepsis or infection,* and the symptoms (probably constitutional) are exaggerated by any kind of instrumentation, or (2) when the stricture *has become unyielding* through many attacks of inflammation. Even then, much may be done to relieve the patient, if he can afford ample time for a course of treatment carried out with strict attention to sterility. But no doubt the quickest method of treatment is to operate, for the free division of the stricture immediately establishes the full size of the

Cases for operation.

Advantages.

urethra, affording ample drainage in septic cases, thus materially assisting nature in throwing off infection. There is also one other point in favour of operation, it lessens the frequency with which instruments have to be used afterwards; thus a patient whose stricture is dilated to a full size probably requires to pass bougies once every three weeks, whereas when the stricture is divided he may go six or seven weeks without danger.

CHAPTER XX.

URETHRITIS.

Definition.

Causes.

URETHRITIS is a generic term applied to all forms of urethral inflammation. It is generally indicated by *pain on micturition,* and by the appearance of an *unusual secretion* "discharge" from the lining membrane. The inflammatory condition may be caused, as in other parts, either by an injury or by the presence and activity of micro-organisms. The symptoms of the former, unless the damage is severe, are generally slight, the secretion or discharge is often hardly noticeable, and subsides comparatively quickly. The latter runs a longer course, and frequently produces constitutional as well as local symptoms.

Introduction of micro-organisms

The micro-organisms gain access to the urethra in a variety of ways, and among them is the use of *dirty instruments and injections, i.e.,* those which are not sterile, thus, a patient who employs a dirty instrument complains of a discharge afterwards, although he has never had such a trouble before. Doubtless, however, the most common path is by the direct contact of the urethral membrane with a surface similarly affected.

The varieties of micro-organisms.

The nature of the urethritis depends of course on the kind of micro-organism introduced, and it is only when the specific, *i.e.,* special microbes are present, that a patient can be said to be suffering from *gonorrhœa.* He may very possibly have symptoms closely simulating this disease, and yet be free from it. All one can say from inspection, is, that he is suffering from a urethritis, capable, most probably, of being transmitted to others, and if he has exposed himself to infection in the ordinary way, is, in all likelihood, suffering from gonorrhœa.

GONORRHŒA—THE SYMPTOMS AND TREATMENT.

Definition.

Gonorrhœa is an acute inflammation generally limited to the first two or three inches of the urethra, but it may, of course, spread and involve even the bladder, and other organs. The inflammation is caused by the inoculation of the membrane close to its orifice, with a particular kind of micro-organism, but its activity is remarkably increased by the presence of other and commoner varieties. In fact, according to the most recent research, it is questioned whether the special organisms can attack the membrane unassisted.

Cause.

Symptoms appear about third day after inoculation.

The symptoms usually appear about three days after exposure to infection, though often there has been some discomfort ever since, namely, slight heat and scalding on passing water. As with other infective processes, the symptoms are local and constitutional.

Locally.

Discharge.

The local symptoms.—The first to be noticed is a thick yellow or greenish-yellow discharge, which rapidly develops and becomes, in some cases, so abundant that it drips from the penis. Following closely upon this are the symptoms caused through the local inflammation, viz., swelling, redness, and

Swelling.

pain. The orifice and tissues around are red and tender to the touch. The lips are swollen and everted, giving the penis the appearance of being cleft at the tip. There is constant discomfort or aching, and a scalding and smarting pain when the urethra is distended by a stream of urine. The stream, which was previously full and straight, is now smaller, and sprayed in many directions, becoming more noticeable as the swelling increases.

Pain and scalding.

The **complications** which arise while the trouble is acute, are, the direct extension of the inflammation along the urethra, giving rise to *frequency of micturition*, or causing so much swelling of the lining membrane that the urine is unable to escape (acute retention, p. 161): inflammation of the bladder may follow, or the testicle may be involved, causing it to become enlarged and very tender. Bleeding from the passage, too, is not uncommonly met with, though a more frequent trouble is the occurrence of a painful erection during sleep, known as *chordee*. A remote consequence of gonorrhœa is the formation of stricture, which, as we have already seen, may not be recognised until long after the last symptom of the disease has disappeared (p. 133).

Complications.

Remote consequence of gonorrhœa.

The **constitutional symptoms** of gonorrhœa are due to absorption of the products of microbic activity. During the acute stage there is generally a chilly feeling at the time the discharge makes its appearance, the patient is feverish afterwards, yet he is rarely subject to high fever or rigors. He loses his appetite, his tongue is dirty, and he complains of a general feeling of malaise.

Constitutional symptoms.

At this period, although usually later, and pro-

Gonorrhœal rheumatism.

bably more of the nature of a complication than a symptom, rheumatic pains of a severe character attack quite suddenly one of the joints. The knee, the ankle, the foot, or the wrist, may be involved, become swollen, and exceedingly painful to touch or movement. I have noticed that rheumatism is much more likely to come on when the inflammation extends backwards to the posterior urethra and bladder, and especially if retention has occurred.

Favourable cases of gonorrhœa terminate in five or six weeks.

If an **attack of gonorrhœa terminates** favourably, the acute symptoms pass off in a week or ten days, and the patient recovers his health. About a month later, the discharge, which at first has become whiter and more sticky, dies away entirely, leaving no sign behind, not even a shred in the urine. In other cases, when, very probably, the disease has spread backwards in the direction of the bladder, the discharge alone continues, and although a good deal altered in appearance, is a constant source of annoyance. One day it is better, and the next it is worse, accompanied by many of the original symptoms, and perhaps slight constitutional disturbances. He is said to be suffering from a "gleet," which runs a very indefinite course, and requires a good deal of treatment to overcome (p. 163).

Gleet.

Treatment of Gonorrhœa.

Treatment.

As soon as the disease declares itself, the patient should rest, I do not say that he should go to bed, but he should remain quiet on a sofa, or in a chair, with his legs well raised. The less he moves about

Rest in recumbent position.

during the acute stage, the more likely he is to make a rapid recovery. The food should be suited to the enforced inactivity, and all alcoholic drinks should be strictly avoided, though it is advisable to drink plentifully of fluids—weak tea, barley, lemon or apple water, and the like—to increase the quantity of urine passed, and to keep the passage well flushed.

Plenty of fluid to be taken but no alcohol.

The penis, around the orifice and under the foreskin, should be kept scrupulously clean, and frequently washed with some weak antiseptic solution, the whole being afterwards covered with a good thickness of specially prepared wool to absorb the discharge as it is formed.* The soiled wool should be frequently removed, and never allowed to become thoroughly sodden.

Cleansing of the penis.

Orifice closed with medicated wool.

Certain drugs, which are eliminated in the urine, may assist matters, when judiciously given by the mouth (salol, urotropine, cystamine, helmitol, &c.). The acute local symptoms are often greatly relieved by hot applications. A hot sitz bath, or a bidet, two or three times a day, considerably reduces the swelling and inflammation, and therefore the pain. When the penis itself is swollen and tender, hot fomentations applied continuously to the organ, while well supported and kept up, are of much benefit, and if the pain on micturition is particularly sharp and cutting the penis should be put into water of 100° to 108° F. and the urine voided while it is immersed.

Drugs to act on the urine.

Local symptoms treated by heat.

A word of caution should be added relative to a very serious complication, namely, infecting the

Infecting the eyes.

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* Some surgeons recommend sanitary gonorrhœa bags.

eyes with the discharge. The hands should always be well washed after touching the organ and any linen used for dressings should be burnt immediately on being removed.

Recapitulation

So much for the treatment of the symptoms, applicable to all forms of septic urethritis, during the acute stage. *Rest* to prevent exaggeration of the disease. *Drugs* and a *large intake* of fluid to counteract, or flush away the products of microbic activity. *Cleanliness and dressing* of the penis to prevent the entrance of any micro-organisms which may assist those already present, and lastly, *the application of heat* to alleviate special local symptoms.

CHAPTER XXI.

GONORRHŒA: TREATMENT BY URETHRAL INJECTION.

WE must now see what further remedies can be adopted to help the cure after the acute symptoms have subsided, that is, when the swelling and redness to a large extent have passed away.*

Direct application of solutions to the part by means of injections.

The disease may be attacked by applying medicated solutions directly to the affected part by means of a syringe, but it is quite clear from what has been said already, that such solutions must be *absolutely sterile*, that is, free from all living matter, before they are applied, otherwise we shall only increase the trouble by introducing fresh doses of microbes.

Their mode of action.

Strong solutions are bad

Abortive treatment.

The solution should be very weak, and not used with the idea of destroying the organisms, but only to bathe the lining membranes with such drugs as may help to give them tone and resistance. *I am utterly opposed to the use of strong solutions.* The idea of eradicating the disease by destroying the mucous membrane deeply enough to kill all the existing micro-organisms must surely be fallacious. The specific microbes cannot be reached, and without taking into account the acute symptoms which always follow severe cauterization, the tissues must be rendered more susceptible to their invasion. The treatment known as the *abortive* method, in

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[*] Recently I have used weak injections of adrenalin (1 in 2,000) in the acute stage of gonorrhœa, apparently with some benefit.

the majority of cases, I believe, does far more harm than good.

A well made injection also washes away the urine, which naturally moistens the canal, and so cleanses the affected part. Failure in obtaining good results is often due to the patient not knowing how to make injections, or else to the septic and clumsy application of the remedy; I therefore add some simple directions.

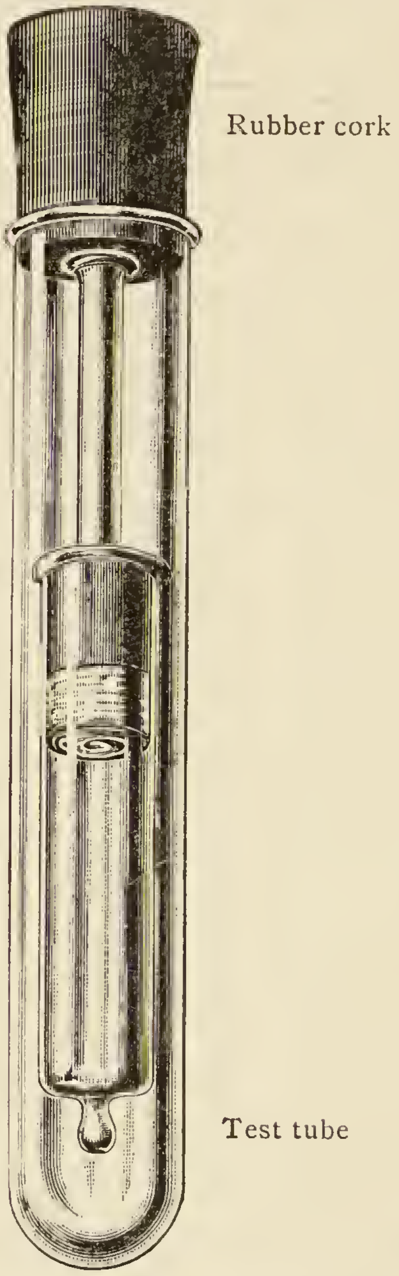

Fig. 37.—A good form of urethral syringe. The shoulders are square and the nozzle short. The syringe is suspended in the test tube by the rubber cork.

Apparatus required to prepare the injection.

The apparatus required to prepare a sterile injection are, a spirit lamp, a tumbler of cold water, a syringe in a test tube (fig. 37), and a tube holder.

The form of syringe.

A *syringe* made of glass, holding two to three teaspoonfuls of fluid, with a square shoulder and short rounded nozzle, is the best for the purpose (fig. 37).

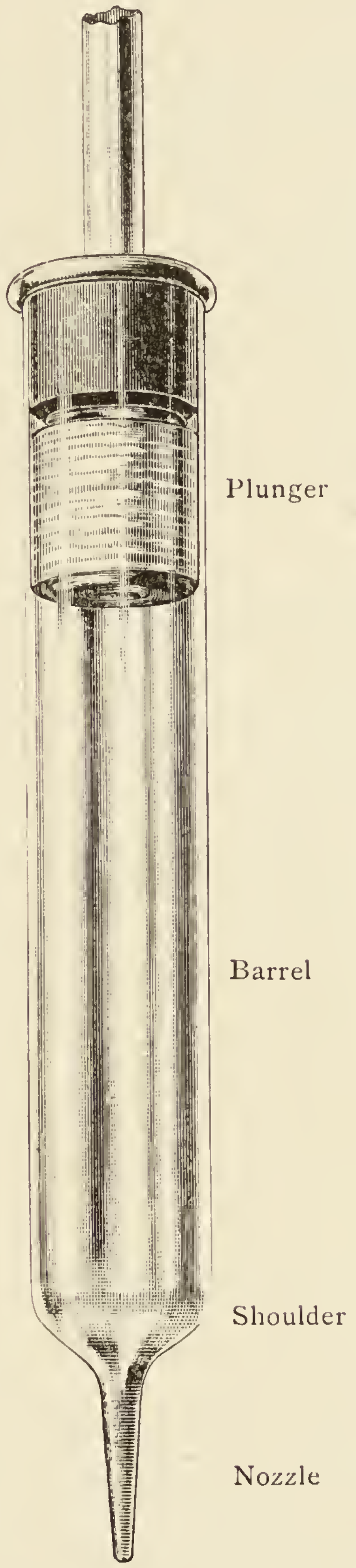

FIG. 38.—A badly constructed urethral syringe. It is too large, the nozzle is too long and the shoulders slant.

The plunger fits the barrel closely and the rod carries an indiarubber cork externally. The syringe is suspended in a test tube of sufficient size to hold it without touching, and its nozzle is prevented from resting on the bottom when the plunger is drawn out, by the rubber cork which fits the mouth of the tube.

If the shoulders are slanting and the nozzle long, the tendency is to push the syringe too far into the urethra, dilating the orifice, and damaging the inflamed tissue for a considerable distance, and moreover it does not make a good joint with the penis (fig. 38).

Sterilising the Syringe and Injection.

Method of sterilising syringe and injection.

The syringe is taken out of the test tube and the *plunger pulled out* to its full extent. The test tube is half filled with the solution to be used, and the empty syringe again hung in the tube. The indiarubber cork should rest quite lightly in the mouth and the fluid should cover the top of the barrel of the syringe. The apparatus is now held in a slanting position over the flame of the spirit lamp by means of the holder supplied, until the fluid in the interior has boiled for a minute. The air in the syringe expands as it is heated and escapes as bubbles from the nozzle of the syringe. Plunge the test tube with its contents at once into the tumbler of cold water, and let it stand there to cool, the cork being previously shifted so that it rests on only one edge of the tube. While cooling, the barrel is *automatically* filled with the fluid which takes the place of the expelled air. Two or three minutes are required to reduce the fluid to 100° F., at which temperature it is best used. When the injection is wanted for some future time the cork is pushed well into the mouth of the test tube after cooling.

PREPARATION OF THE PARTS PREVIOUS TO INJECTING.

Position for injecting.

The patient generally stands to make an injection; no fear of the fluid running back into the bladder need be entertained. The plan, often suggested, of sitting on a folded towel placed between the legs, to compress the urethra near the bladder, will be unnecessary, if only the proper charge (that is the quantity of fluid held by the syringe) is used. For we must remember, that the urethra is closed throughout, and is not an open tube, except when distended with fluid. The two or three teaspoonfuls injected can, therefore, only pass backwards for a limited extent, and to introduce it a definite amount of pressure is required, and also a tight joint between the instrument and the top of the penis.

The following preparations should be made immediately before injecting:—

1. The **necessary appliances** are placed near by, viz., the syringe, charged and sterilised, the pieces of wool soaking in the antiseptic solution (p. 39), and the vessel, on a chair or stool, to catch the injection when returned.

Preparation of clothes, hands, and penis.

2. The **clothes are well undone** and adjusted so that nothing can touch the organ or interfere with the operation.

3. The **foreskin is withdrawn** and all the urine voided.

4. The **hands are washed,** and without being dried, immediately rubbed with a piece of moistened wool.

5. The first finger and the thumb of the left hand **hold the penis,** the latter being above, the former directly below, both being placed half an inch from the orifice.

6. The lips and top of the penis are carefully **cleansed** with another piece of moist wool.

MAKING AN URETHRAL INJECTION.

Making the injection into the urethra.

The top of the barrel of the syringe is held between the thumb and second finger of the right hand, the first finger resting gently on the top of the rubber cork. The nozzle is carefully inserted between the lips of the urethra, and the square *shoulders pressed firmly* against the tip of the penis so that a water-tight joint is formed. The plunger is now slowly, but firmly, pushed home with the first finger of the right hand, and the injection driven into the urethra, distending it for a short distance. As the syringe is removed the penis is lightly pinched to retain the injection for a second or two.

Failure.

No fluid should escape at the *junction* of the syringe with the penis while injecting, if it does, the manœuvre has been improperly carried out and must be repeated. When the pressure is relaxed the fluid spirts out, a sure sign that the operation has been satisfactorily performed.

How often to inject.

One well made injection is all that is necessary at a time, though it may be repeated two, three, or more times a day.

Solutions suitable for urethral injection.

The **solutions** which I find give good results for urethral injection are, *zinc sulphate*, six grains to six ounces of distilled water, with three or four minims of dilute sulphuric acid; *zinc chloride*, three grains in the same amount of water and a little free hydrochloric acid; *silver nitrate*, half a grain to the six ounces and either two or three minims of dilute nitric acid, or an equal amount of ammonia. *Sodium bicarbonate*, one grain to the ounce and *normal salt solution*. Protargol has been very extensively used but I have found no special advantage result from its employment. In the acute stage, where there is much pain, I have found hemisine—a preparation of adrenalin—1 in 2,000, sometimes useful.

SOLUBLE BOUGIES.

Soluble bougies, their composition and action.

The application of medicaments to the urethra in the form of soluble bougies is a well recognized method of treatment. The bougie, which is of cylindrical shape, is composed of gelatine, glycerine, and water; or gum and starch; or cocoa butter; the latter being often stiffened with a spiral wire spring to facilitate its introduction. Dissolved or suspended in these excipients, are, sulphate or chloride of zinc, nitrate of silver, iodoform, &c. The bougie is passed into the urethra, without any attempt at sterilisation, and left there to melt, the drug being thus constantly applied to the affected mucous membrane. I do not advise this treatment; the irritation and inflammation following their introduction are often severe, and they are not compensated for by good after effects. *Possibly*, if the bougie itself were sterile and not too irritating, and was introduced without contamination the results might be more satisfactory.

CHAPTER XXII.

SOME OF THE COMPLICATIONS OF GONORRHŒA, AND THEIR TREATMENT.

To complete the description of an attack of gonorrhœa, from a patient's point of view, a few words of advice are often needed on one or two of the complications sometimes accompanying the disease, and which have already been mentioned.

I. ACUTE RETENTION OF URINE IN THE BLADDER.

The onset.

Commencing retention, which generally occurs during the acute inflammatory stage, and also after the use of strong injections, is indicated by the fact that there is more difficulty in passing water. The difficulty becomes more pronounced as the attack develops, the calls to micturate are stronger and more frequent, but, notwithstanding these repeated trials, the quantity of urine passed in a given time—say in four or five hours—is less than natural. There is now a feeling of fulness and distension in the lower part of the abdomen, which becomes severe pain extending into the flanks or rectum whenever the patient strains to pass a few drops of urine. These recurring and ineffectual struggles cause great distress and exhaustion, and, if not speedily relieved, may lead to permanent damage to the bladder hereafter. *Skilled advice should be*

The symptoms.

Treatment.

sought at once, but in the meanwhile the patient should sit in hot water, deep enough to cover the buttocks, and allow the drops of urine to escape while in the bath, if fortunately he is able to do so without straining. Drink of all kinds, especially alcohol or any fluid known to stimulate the kidneys, should be *avoided,* for the absorption of liquids must necessarily add to the distress. The question of *drawing off the urine by the catheter* will be settled by the medical attendant, and is often the safest way of overcoming the difficulty, and in some cases must be repeated many times before the natura function of the bladder is restored.

II. CHORDEE.

Chordee, a painful form of erection in which the penis is bent or arched, generally occurs during the acute stage of gonorrhœa. It may come on suddenly at any time, but more often during sleep, and is sometimes entirely unassociated with any sexual desire, though perhaps the most usual cause is the occurrence of erotic feelings. Among the predisposing causes are the use of stimulating foods and drinks, sleeping too warmly or on the back, and the application of strong injections to the urethra. Chordee is also not infrequently caused by a full bladder, and the patient should be instructed to relieve himself whenever he wakes at night. The treatment—attention to the foregoing rules—is mainly preventive, though, when chordee arises, the application of cold to the organ itself, to the

Predisposing causes.

parts in the immediate neighbourhood or to the perineum is usually effectual and will soon check the trouble. With regard to internal remedies, I have found very little benefit result from the administration of those drugs most usually prescribed (camphor, &c.). Chloral hydrate and morphia certainly produce the desired effect, but the patient has to pay too dearly for the relief given him. A suppository of one grain and a half or more of the extract of belladonna is better, but I prefer 15 or 20 grains of sulphonal two hours before bedtime. The drug is apparently harmless and acts not only as a hypnotic, but also as an anaphrodisiac.

Internal remedies.

III. GLEET.

Gleet, when once established, is an exceedingly difficult trouble to cure. It may run on for months or years, either as a visible discharge, or as shreds in the first few drops of urine voided. Again, both these evidences of the disease may be absent, and the patient thinks he is entirely cured, yet small floating specks, expelled at the end of micturition, will be found on examination. All these should be looked upon with suspicion, and every endeavour made to get rid of them before marriage is consummated. On the other hand there are shreds, and even discharges, which are innocuous. Thus, a man who has been a celibate for a considerable time, frequently sees at the end of the penis a fluid like glycerine, or perhaps even milky looking, while at stool. It is only a part of the supra-abundant secretion, which, as it is not naturally dis-

Gleet communicates disease.

Troubles simulating gleet.

charged, escapes on straining. Sometimes the shreds noticed are composed solely of mucus, and contain nothing infective whatever. Nevertheless, a patient who has once had gonorrhœa should assure himself, by applying to an expert, that they contain nothing capable of transmitting the disease to another person.

Gleet: result of gonorrhœa.

Gleet most commonly results from an attack of gonorrhœa *spreading back* towards the bladder, and, from its situation, is therefore totally unaffected by the ordinary urethral injection. Its treatment, although carried out on similar principles, by injection, &c., must be left to the surgeon.

The treatment of inflammation of the deeper parts of the urethra, as well as of the testicle (orchitis) and bladder (cystitis), referred to on page 149, must be left in skilled hands, although the treatment of the last named is carried out exactly on the same lines, as when associated with retained urine (pp. 115-125).

CHAPTER XXIII.

THE URINE.

MUCH has been said in the preceding pages on the examination of the urine, more especially in relation to its physical character. I may be excused, therefore, if I point out some of the more important points to be observed.

Changes in urine from mechanical and chemical causes, and from microbic agency

Specimens of urine, kept for future examination in the usual way, quickly undergo marked changes. The changes are of two kinds, *firstly*, those arising from purely mechanical and chemical causes; and *secondly*, those due to the agency of saprophytic micro-organisms, which effect the breaking down of the more complex into simple bodies.

Deposits from healthy urine.

Healthy urine is quite clear when passed, but if allowed to stand and cool, invariably throws down a cloud of mucus, which remains suspended in the fluid, and very frequently also a flocculent precipitate of pinkish lithates. When abnormal quantities of uric acid are held in solution, crystals form, and are seen as "cayenne pepper." In the same manner, under certain circumstances, various other crystalline bodies make their appearance—oxalates, triple phosphates, &c.

Decomposition in sterile urine caused by dirty vessels.

The chief changes, however, are caused by the activity of micro-organisms. The urine may be sterile when voided, and will then remain unaltered indefinitely, as far as decomposition goes, if properly collected and preserved; but if it is received into a dirty vessel, radical changes rapidly follow. On the other hand, in urine already septic, and which will then probably also contain substances (pus, &c.) arising from infection of the tissues, the process of decomposition already begun is continued, and even accelerated, if it is preserved in a dirty vessel. Thus, septic urine which is slightly acid when voided soon becomes alkaline, a few stray earthy phosphates become multiplied many times, and perhaps massed together on mucus, giving the appearance of a phosphatic concretion; or again, the pus, mucus, and other products which were previously distributed throughout the specimen, collect into a ropy mass floating in a comparatively clear fluid, or form a slimy deposit on the bottom of the vessel. The smell, which was hardly noticeable, becomes putrid or ammoniacal.

The changes produced in urine by micro-organisms.

Fallacies in reports on stale urine.

The report, therefore, on the examination of a healthy specimen of urine which is clear, acid, with normal smell, might be, after twenty-four hours delay, slightly cloudy, neutral, with deposit of crystals, offensive; or a sample that is septic when passed, and was rather thick, slightly acid, and offensive, might be nearly clear, with ropy mucus, alkaline or ammoniacal, with a deposit of earthy phosphates; putrid. If we base our estimate of the patient's condition on such analysis, our deductions must certainly be wrong.

Importance of examining urine when freshly passed.

From the foregoing, it is clear how necessary it is to examine the urine directly it is passed, and before it cools, if a correct idea of its character as it is in the bladder is to be formed. I do not say that a good deal of information cannot be gained by examining it after standing, but then special precautions must be taken to prevent it becoming contaminated with micro-organisms, while it is being passed, or by the vessel in which it is caught and preserved.

Method to be adopted in passing urine for examination.

To facilitate the examination, and also to establish a rough differential diagnosis, the patient should always be directed to adopt Sir Henry Thompson's plan of dividing the urine into two portions, the first two or three table-spoonfuls voided being received into a wine glass, and the remainder into a glass bowl. The former then contains most, if not all, the urethral products, and also the larger part, proportionately, of the mucus, and the latter, a fair sample of the urine as it is in the bladder, free from the extraneous matter of the urethra, which might vitiate the analysis.

Examination always made in glass.

Both specimens should be examined *at once*, and *always in glass*, for it is impossible to judge of slight degrees of cloudiness, or to see small particles of abnormal substances in earthenware and by reflected light alone. Shreds should be looked for in the first glass, and if they exist while there are none in the bowl, urethral trouble is probably present. Again if the urine is of the same character in both (say for instance cloudy) the conclusion to be drawn is, that the mischief is not limited to the urethra ; and, finally, if the first portion is nearly clear and the second cloudy, as may be seen in cases of phosphaturia, or local inflammation of the bladder, the inference is, that the urethra is free from disease.

Significance of various products seen.

Dividing urine into three parts.

In special cases dividing the urine into three parts is of assistance in arriving at a diagnosis. The third, or last portion passed, will contain either the deposit which has settled out of the urine while retained in the bladder, as in cases of phosphaturia, and is then thicker than the rest; or else abnormal substances squeezed out of the tissues by the muscular compression of the bladder wall, for instance, blood from a papilloma or from inflamed mucous membrane, or minute shreds, composed chiefly of pus, from the prostate in old standing cases of gleet. The appearance of blood in the third glass must, of course, limit its origin to the bladder and prostatic urethra.

Physical signs.

The colour, the reaction, the smell, the translucency, should all be noted at the time the urine is passed.

Colour.

The **colour** often gives a clue as to the condition of the liver and the kidneys, and whether the patient is under mental excitement, or again, a smoky tint may suggest the presence of blood.

Reaction.

The **reaction.** The fact that the urine is neutral or alkaline, does not necessarily indicate that it is undergoing decomposition, but at any rate, this reaction shows that the secretion is abnormal, and the presence of various crystals may be suspected.

Smell.

The **smell,** if coupled with alkalinity, frequently determines the question of decomposition, and it may also suggest the presence of irritating substances, or that certain foods have been taken. A patient has a sudden attack of frequent painful hæmaturia without any premonitory symptoms. The smell of violets would suggest turpentine, and on questioning him it will be found that he has had it applied in stupes, or has taken the drug as an anthelmintic.

Translucency.

The **translucency.**—Healthy urine is always perfectly bright until the mucus is precipitated. If there is any suspicion of haziness when voided a few drachms should be subjected to the centrifugal machine and the separated deposit examined microscopically. Blood, pus, epithelium, casts may then easily be found, and also crystals which exist as natural to the urine before it is expelled. Pus indicates, of course, that some area of the *tissues* connected with the urinary organs have become infected. Nevertheless the urine may be septic, without the presence of pus, as is indicated by smell, reaction, and also by the direct evidence of the presence of the micro-organisms. They are, in fact, attacking and *living on the urine itself* and do not directly affect the tissues in any way. In other cases microbes are simply being eliminated from the body by this channel, as in typhoid, &c., playing no active part there, either in connection with the urine, or with the tissues, but the urine must nevertheless be looked upon as contaminated.

Centrifugalisation.

Examination of deposit.

Urine which is markedly cloudy need not necessarily be centrifugalised, a few drops put on the microscopic slide is all that is required. Yet the machine is a great aid in diagnosis, and does away with the necessity of allowing the urine to deposit, thereby preventing mechanical, chemical, and microbic changes in the composition of the urine, and therefore the appearance of adventitious substances.

Advantages of centrifugalisation.

When urine is to be examined *at some future time*, it should be caught in a glass bottle that has been quite recently boiled. The orifice of the

Preservation of urine for future examination.

urethra is well cleansed with a piece of gauze moistened with an antiseptic, or alcoholic soap solution. I generally give patients, who have to send specimens, two large test tubes, fitted with rubber plugs; I direct them to boil all immediately before use, and also to cleanse the penis first with soap and water, and afterwards with perchloride of mercury solution immediately before passing water. The urine should be voided directly into the two tubes which are marked 1 and 2.

Significance of the deposit of mucus.

Samples obtained in this manner, are fairly satisfactory for examination, if the urine itself is sterile, though one is always bound to be suspicious about crystalline deposits. Information of some importance may be attained by watching the amount of mucus deposited in the two tubes. As a rule the first glass contains relatively the larger part, but if this is disproportionately increased, urethral irritation might be reasonably suspected; or should the excess occur in the second tube, while there is nothing abnormal in the first, irritation in the parts above the urethra would be suggested. In illustration of these two points examine the first portion of the urine voided seven or eight hours after an instrument, sterilised with an *antiseptic*, has been used, it will be found to be more cloudy than is usual: or the second portion, when a patient is suffering from a pure uric acid stone.

Septic urine cannot be kept for examination.

Septic urine cannot be kept for examination, for the decomposition already commenced continues, and new substances make their appearance so quickly that no correct estimate can be formed.

Rate of decomposition.

On the other hand some slight evidence may be adduced by watching the rate of decomposition; or whether the urine which is healthy in appearance, is so or not, that is, whether any visible alteration takes place on keeping it. As a rule, I have found the first portion of urine passed more prone to decompose than the second, although both tubes have been subjected to the same process of sterilisation.

Urine for chemical analysis.

I shall not touch upon the question of the chemical analysis of urine. The importance of obtaining samples taken from the whole of the urine passed in twenty-four hours, for this purpose, is obvious. An estimation of the amount of albumen or sugar without this precaution is of little value. One other point needs mention, the statement that urine contains albumen should be very guardedly made, when pus or blood is present, and special stress should be laid on this fact, otherwise a patient might be said to be suffering from kidney trouble, when in reality, he is the subject of some infective disease of the bladder or urethra.

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